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THE
FERN BULLETIN

A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

VOLUME XIX

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JOLIET, ILL.
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Vol. XX

No. 1

The Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1911



The Fern Bulletin



A QUARTERLY DEVOTED TO FERNS

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ASPLENIUM ANDREWSII.

THE FERN BULLETIN

Vol. XIX

JANUARY, 1911

No. 1

LYCOPODIUM POROPHILUM IN THE DELLS OF THE WISCONSIN.

BY E. J. HILL.

A week's sojourn in the Dells of the Wisconsin in August, 1910, gave me an opportunity to study *in situ* the small club-moss (*Lycopodium porophyllum* Lloyd and Underw.) or as given in "Gray's New Manual," *L. lucidulum* Michx. var. *porophyllum* Clute. It was described as new in the "Bulletin of the Torrey Botanical Club" 27:150, 1900. The type was found by Underwood in Putnam County, Indiana, in 1891. In 1893 he collected it in the Dells of the Wisconsin, and in 1896 in Alabama. Two collections in Kentucky are credited to Miss Sadie F. Price, 1896 and 1898. These are all the stations mentioned with the description. As the date of the collection in the Dells (Aug. 19th) closely corresponds with mine (Aug. 11-18) I must have seen them in about the same stage of development as did Underwood. The type was taken in October; the other collections were all made in June.

Soon after meeting with it the first time it became a question to me whether it was specifically distinct. Having a copy of the "Manual" with me it was readily identified with the variety. It was first seen on shelves of rocks in a deep ravine called the Artist's Glen; the next time with a like habitat in the Cold-water Canyon. *L. lucidulum* was also found in the latter ravine, and looked so different, though growing under the same

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conditions, as to leave little doubt that they were two distinct species. The third and last time it was found on the west side of the river, the other two stations being on the east side. The plants were on shelves of rock bordering the entrance to what is called "the old river channel," or a former bed of the Wisconsin now abandoned, but forming a lagoon. Fortunately *lucidulum* and *porophilum* were here so close together as to make a mixed association, so that a fine chance was offered to see if there were intergradings. But none were detected, each preserved its distinctive characters. Some examples of *porophilum* being the most marked of any I had seen. As the patch was not a large one, every plant could be individually examined, but they were as unlike as in cases where they were found growing apart. I had in the meantime come across *L. lucidulum* in another ravine or narrow rock cutting, the Witches Gulch, which, though smaller than usual, was otherwise well marked and easily identified. Both kinds, as far as my observations went, are infrequent in the Dells, the *L. porophilum* seemingly better represented.

The characters most apparent to the unaided eye are the clustered stems and their small size, in this reminding one of *L. Selago*. A closer inspection shows that the stems are completely vertical, or the horizontal part when present but three or four inches long, giving a slight horizontal turn, or perhaps a mere bend from a vertical direction. This is quite different from most examples of *L. lucidulum*. The narrower and essentially entire leaves are a good character. On comparing the sporangia those of *porophilum* are found to be 1.2—1.5 mm. long, averaging about 1.35 mm., those of *lucidulum* 1.5—1.75 mm. mostly about 1.7 mm. The latter have a broader and somewhat deeper

sinus, and are more tinged with yellow. These comparisons are mainly based on the examples found growing together, both being in fruit. Most of the others were in fruit also.

The habitat of *L. porophilum* is given as sandstone, being confined to this substratum as far as known. The plants in the Dells were all on shelves of Potsdam sandstone, and with a north exposure, deeply shaded but not very moist, usually well up towards the upper part of the rocks. The *L. lucidulum* did not differ in this respect, though Underwood says this in Indiana took a lower, moister place when the two were neighbors. It would more accurately characterize the conditions in the Dells to say that they grow in the shallow beds of humus on shelves of sandstone. Possibly the roots may reach the rock.

Chicago.

ASPLENIUM ANDREWSII.

BY WILLARD N. CLUTE.

Some time during 1904 Mr. D. M. Andrews, well known as a plant collector and nurseryman, found a small fern growing in the crevices of a white sandstone cliff in Boulder Canyon, Colorado at an altitude of about 5000 feet. The fronds were quite small and somewhat triangular in shape but suggested those of *Asplenium Bradleyi* to which the plant is manifestly related if, indeed, it is not specifically identical with it. Prof. Nelson, to whom Mr. Andrews sent specimens regarded it as a distinct species and in the "Proceedings of the Biological Society of Washington," for December 27, 1904, described it as *Asplenium Andrewsii* in honor of the discoverer.

It is quite likely that had this fern been found in a colony of *Asplenium Bradleyi*, further east, it would

have been passed over as an extreme form of the species, but found growing in Colorado where, so far as known, *A. Bradleyi* does not occur the conclusion may be reached that it is entitled to specific rank and this is helped out by the difference in size and the general outline of the fronds, though there are many that insist that it is merely a form of *A. Bradleyi* that has been produced by the changed conditions under which it grows. In order that the problem may be better judged we present herewith a drawing of the fern, the first, so far as we are aware, that has been published.

The most noticeable characteristics of the fern are the small size of the fronds, the triangular blades nearly twice pinnate, the triangular pinnae, and the short dark stipes. The rachis is generally pale green and the rootstock clothed in dark brown hairs.

Viewed by itself we are inclined to call it a good species but we confess to a strong desire to know what would happen if plants were grown from its spores and given more suitable surroundings. Our frontispiece is from specimens collected at the type locality by Prof. E. Bethel and kindly communicated by Mr. W. A. Poyser. The illustration is about natural size.

NOTES ON THE PTERIDOPHYTA OF SOUTHERN NEW BRUNSWICK.

BY A. B. KLUGH, M. A.

The region covered by these notes is the St. Croix River Valley and the territory in the vicinity of Passamaquoddy Bay in Southern New Brunswick. The greater part of the region was originally covered by a coniferous forest formation consisting largely of *Picea Canadensis* (white spruce) with which *Betula alba papyrifera* (paper birch) was intermingled. At

the present time much of the land is cleared, but large stretches of the original forest still remain. In the region there are several large bogs, particularly on Campobello Island, a lake some two miles long and numerous small streams. A locality of particular interest is Chamcook Hill, some 800 feet in height, at the base of which on the eastern side is a small patch of deciduous forest, while the slopes are covered by *Picea Canadensis* and the summit consists of bare trap rock.

The outstanding feature of the flora as far as Pteridophyta are concerned is the abundance and luxuriance of various species of *Lycopodium*.

In the following list the nomenclature is that of Gray's Manual.

Polypodium vulgare. Rare. Only found on a rock near St. Andrew's and on rocks on Chamcook.

Phegopteris polypodioides. Abundant in woods.

Phegopteris dryopteris. Common in woods.

Pteris aquilina. Common in dry soil.

Asplenium filix-foemina. Common in both dry and moist locations.

Polystichum acrostichoides. Rare in moist woods near St. Andrews and common in deciduous forest at the base of Chamcook.

Aspidium thelypteris. Frequent in marshes

Aspidium noveboracense. Rare in moist woods near St. Andrews.

Aspidium cristatum. Rare in woods near St. Andrews.

Aspidium spinulosum. Common and very luxuriant in woods on Campobello Island.

Cystopteris fragilis. Scarce on rocks near St. Andrews.

Woodsia ilvensis. Common on the summit of Chamcook.

Dicksonia punctilobula. Abundant in moist woods throughout the region. The scent arising from beds of this fern when after a hot day the cool moist breezes come in from the sea is most delightful.

Onoclea sensibilis. Frequent in marshes.

Osmunda claytoniana. Common in moist woods.

Osmunda cinnamomea. Frequent in moist situations.

Botrychium obliquum. One specimen in a dry heath on Deer Island.

Botrychium ternatum intermedium. Frequent in a dry heath near St. Andrews.

Equisetum arvense. Common.

Equisetum sylvaticum. Frequent in a swale near St. Andrews.

Equisetum fluviatile. Common in a marsh near Chamcook.

Lycopodium lucidulum. Frequent in moist woods.

Lycopodium lucidulum porophyllum. Rare in deep moss (*Hypnum schreiberi*) in coniferous woods on Deer Island.

Lycopodium inundatum. Common over a small area on a bog on Campobello.

Lycopodium annotinum. Common on the slopes of Chamcook.

Lycopodium annotinum pungens. Rare in a bog near Herring Cove, Campobello Island.

Lycopodium clavatum. Common.

Lycopodium clavatum monostachyon. Frequent on a heath near St. Andrews.

Lycopodium obscurum dendroideum. Common. Particularly luxuriant at edge of coniferous woods on Deer Island.

Lycopodium complanatum. Scarce on a dry bank near Chamcook Lake.

Lycopodium complanatum flabelliforme. Common.

Isoetes echinospora braunii. Frequent along the south margin of Chamcook Lake and abundant in a small shallow stream which flows from Chamcook Lake to the seas. In this stream this species and *Lophotocarpus spongiosus* were practically the only macroscopic vegetation and the *Isoetes* formed dense mats and existed here over some hundreds of square yards.

Botanical Dept., Queens University, Kingston, Ont.

ANOTHER FORM OF DICKSONIA.

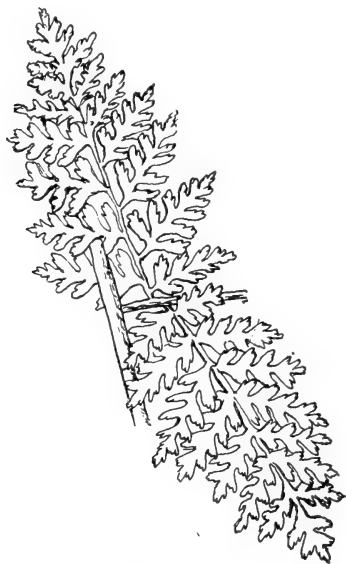
BY WILLARD N. CLUTE.

As our country grows older and the chance of finding new ferns diminishes it is practically certain that more attention will be given to the forms of ferns than they receive at present. It is scarcely likely that our students will ever take up this side of the subject with the enthusiasm with which it is handled in Great Britain—our climate does not favor it, for one thing—but when the study of forms does come in for more intensive treatment the forms known at present will be all the better for being named and I take this opportunity to add still another to the described forms of *Dicksonia*.

Had the plant which produced this form been preserved and multiplied it would have been considered quite the handsomest member of our fern flora. The two secondary pinnae which we illustrate natural size can give but a poor idea of the beauty of the whole frond. Its appearance strongly suggests some of the tropical *Davallias*. The form differs from the type in

the much broader primary pinnae which bear secondary pinnae that are themselves nearly twice pinnate, giving the frond a lace-like effect hard to describe.

The frond from which the description was drawn was found by H. W. Merrill nearly four years ago at



DICKSONIA PILOSIUSCULA F. POYSERI.

Hiram, Maine. It is now in the herbarium of Mr. W. A. Poyser for whom I take pleasure in naming it DICKSONIA PILOSIUSCULA f. POYSERI. So long as the most stable thing about fern nomenclature is its instability it may be well to mention that those who do not fancy the name here given may call the fern *D. punctilobula Poyseri* or *Dennstaedtia punctilobula Poyseri*. It is all the same in the long run.

THE OAK AND BEECH FERNS.

BY ADELLA PRESCOTT.

These ferns are among the many whose proper names are a subject of dispute, for while the fruit dots of the species are like the polypodies in that they have no indusion yet they differ in some important respects. One difference is in the position of the fruit dots which in the polypodiums are on the ends of the veins while in the phegoterids they are on the *backs*; and another and perhaps more important difference is that the stipes are not jointed to the rootstock as they are in the *Polypodiums*. But these questions do not affect the beauty of the ferns which is the most important thing from an amateur's point of view so we will call them *Phegopteris* and let those who think otherwise prove it if they want to and can.

I had read of the daintiness and beauty of the oak fern but had never seen it until one day when walking beside a road leading through a wooded swamp I unexpectedly found a broad carpet of the exquisite things stretching before my feet. There were hundreds of them and every frond seemed to be perfect and if the day had brought me nothing else (which it did) it would linger long in my memory.

The oak fern (*Phegopteris dryopteris*) is a small fern with a spreading horizontal blade suggesting a miniature brake. It has a slender creeping rootstock and the blade is divided into three nearly equal parts each of which is pinnate with deeply lobed pinnules. The stipe is very slender and the blade is a brilliant yellow green—"the greenest thing in nature" as one writer puts it. The sori are not conspicuous and are borne near the margin of the pinnules.

The oak fern is found in the Old World as well as in

the Northern States and Canada. It delights in rich, moist soil and is easily cultivated, soon forming dense mats if planted in a congenial spot.

It was in a very different location that I first saw the long beech fern, (*Phegopteris polypodioides*). I was walking along a path where a wooded hill sloped sharply to the roadside when a slender fern tip almost thrust itself into my hand from the tangled thicket that completely concealed the rest of the plant. There could be no mistaking it and I eagerly searched for more but found only two plants, though I was told later that quite a colony grew in the vicinity. Like the oak fern it has a slender creeping rootstock and produces fronds all summer. The fronds are rather soft in texture, once pinnate with long narrow pinnales. In the upper part of the frond the pinnae are attached to the rachis but the lower pair are usually separate and hang forward and downward in very noticeable way. The sori are quite small and without indusium as in the true polypodies.

The broad beech fern (*Phegopteris hexagonoptera*) is so much like the long beech fern that it is not always easy for even an expert to decide between them. Generally speaking it is shorter and broader than its relative with the lower pair of pinnae *much* larger than the others, but the two species shade into each other in a way that is very perplexing and while I labeled some specimens in my herbarium "hexagonoptera" in my blackest ink, conscience later insisted on penciling a question mark after the name. The Puritans were grand folk but they made life rather hard for their descendants.

The species averages somewhat larger than the long beech fern and the pinnae form a conspicuous angled wing along the rachis the shape of which has suggest-

ed the specific name. The common name of the beech ferns is said to have given because of their fondness for beech trees but I fancy that preference is largely imaginary.

New Hartford, N. Y.

RARE FORMS OF FERNWORTS.—XVII.

BOTRYCHIUM SIMPLEX.

Commenting upon the observations of Mr. Raynal Dodge regarding the specific distinctness of the lesser *Botrychiums*, published in a recent number of this magazine, Mr. H. Woynar of Graz, Austria says: "I do not understand how you can conceive of *Botrychium simplex* being a depauperate form of *B. matricariaefolium*. Of the latter, there are only a few to be found in the Tyrol and it is a totally different plant. *Botrychium simplex* is extremely variable, but all forms are connected and a series shows a developed evolution with a great abundance of forms running from *simplicissimum* to *compositum*. That the depauperate form may resemble both species is no proof of relationship nor is the fact that they sometimes grow together. *Botrychium tenebrosum* belongs, as the observations of the author and photo of the Eatonian plants by Waters shows, to *B. simplex* and not to *B. matricariaefolium* as you maintain in opposition to Eaton." Mr. Woynar sends several prints of different forms referred to *B. simplex* in the Old World and among them are specimens that he regards as identical with *tenebrosum*. These grow with *Sphagnum* and species of *Drosera* in the Tyrol where the plants in general are swamp plants. He adds further: "The opinion of R. Dodge places annual plants first although the *Botrychiums* develop very slowly and

even the most diminutive little plants may be more than ten years old. It would indeed be interesting to learn how totally different buds of intermediate forms of *B. lanceolatum* and *B. matricariaefolium* are related. This is surely an "internal appearance."

In reference to this whole subject it may be said that the confusion has been worse confused by the lack of information about the lesser grape ferns among even our best botanists. The plant is so seldom collected that many of the makers of botanical manuals never saw a fresh plant, and the arranging in the herbarium has not conduced to further clearness. It is now reasonably certain that some of the specimens upon which Dr. Hitchcock founded his description of this species were really young plants of *B. matricariaefolium* and this accounts for some of the discrepancies that occur in the descriptions of modern authors most of which have cribbed their information from older writers. If the original describer could not distinguish between the two it is not to be wondered at that others have erred in attempting to follow his description. As a matter of fact, and as Mr. Woynar's prints show, *simplex* is distinguished from the other small grape ferns by the generally rounded outlines of the leaf segments, which suggest those of the moonwort (*B. lunaria*). Certain forms of *Botrychium matricariaefolium* also have these rounded segments and here is doubtless where the confusion between the two plants begins.

Both D. C. Eaton and Geo. E. Davenport were of the opinion that the form called *compositum* was the fully matured plant. In this form, which is not easily confused with other species of *Botrychium* the sterile portion is rather large, springs from near the base of the plant and is inclined to be ternate after the manner

of the common grape fern (*B. ternatum*), the whole plant being quite stout and fleshy. An illustration of this form about natural size is given with this article.

The common form of the plant is the one-called *incisum* or possibly *sub-compositum* since these two are



FORMS OF BOTRYCHIUM SIMPLEX.

much alike. *Incisum* has an ovate sterile segment incised into one or two pairs of lobes while *subcompositum* has a greater number of lobes, the lowest of which are petioled and somewhat remote from the others. The variety *fallax* is like *incisum* except that

the sterile segment is borne farther above the base—a very small difference to found a variety upon, we are inclined to think even in this day of species-making. *Angustum* is a small narrow form and *simplicissimum* is, as its name indicates, a poorly nourished form with a very small, entire sterile segment and less than half a dozen spore-cases in the fertile spike. We illustrate three of the more prominent forms taken from Mr. Woynar's prints.

THE FERNS OF NORTHWESTERN MISSOURI.

BY F. C. GREENE.

The following rather incomplete notes are offered as a preliminary list of the ferns of northwestern Missouri. The country adjoining the Missouri river proved to be a surprise for with its bluffs of limestone, sandstone and shale it promised to yield many species. The total noted was eight. Many of the old familiar friends of the East were either wanting or rare, notably the Christmas fern which, however, appears to be very abundant in the country bordering the Chariton river to the east.

The one most abundant fern is *Cystopteris fragilis* with the maidenhair a close second, both being noted in practically every county. *Camptosorus rhizophyllus*, *Woodsia obtusa*, *Pellaea atropurpurea* and *Botrychium Virginianum* were seen in many counties and *Onoclea sensibilis* was found in the bottoms of the Nodaway river in Andrew County and to the east in Clinton and Mercer counties. *Asplenium angustifolium* appears to be rather rare along the Missouri river.

The most interesting fern of the region is *Notholaena dealbata* found growing exclusively in limestone bluffs wher local semi-arid conditions prevail.

Colonies of about thirty plants were found near Farley and Platte City in Platt County. On the whole, this delicate little plant may be said to be rare, but abundant locally.

In addition to the ferns, *Equisetum arvense*, and *E. robustum* are very abundant, the latter forming "brakes" in places and furnishing the name rush creek to several small streams. Along Grand and Chariton Rivers, the country rock is mainly sandstone and a decided change is seen in the fern flora. *Asplenium angustifolium*, *Aspidium noveboracense*, *A. spinulosum intermedium*, *Athyrium thelypteroides*, *A. filix-foemina*, *Osmunda cinnamomea*, *Polystichum acrostichoides* and the form *incisum* which are rare or wanting along the Missouri river are found, many of them abundantly. The distribution as noted above seems to correspond to the rainfall, this increasing toward the east.

Missouri Geological Survey.

PTERIDOGRAPHIA.

FERN NOTES FROM NEW YORK.—In the July, 1910 *Bulletin*, E. J. Hill spoke of finding the *Dicksonia punctilobula* in Genesee County, N. Y. In Ontario County (which is nearly twenty-five miles from Genesee County) I have found this fern in one locality. It grows in a pasture situated between a piece of woods and a tamarack swamp. I have searched for it in other places but have never found another station for it near here. At Canadice Lake, twenty miles south of here, I found a few fronds last summer and I also found the *Woodwardia Virginica*. I had looked in several swamps for it and had decided it did not grow around here but last summer I was in a swamp

after huckleberries and finally got lost in a part of the swamp I had never entered before. Here I discovered a fern which looked from where I was to be the cinnamon fern, but as soon as I came near to it I saw at once it was something I had not seen before and turning one of the fronds over told me what I had found—which only makes good the statement that we find a specimen when we are looking for something else. I have also found specimens of *Equisetum scirpoides* growing in the moss and among fronds of *Cystopteris bulbifera* on a deeply wooded hillside where a tiny stream trickled down from the top of the hill. In all I have found so far twenty-four varieties of ferns and four varieties of scouring rushes and horsetails.—Mrs. George B. Ayers, West Bloomfield, New York.

WOOD FERNS GROUPED ANEW.—Anybody who dabbles much in ferns finally arrives at a point where he figures out a scheme for breaking up the great group of wood ferns, of which, in the widest sense there are not far from two thousand species, into smaller groups that shall more nearly express relationship. The British have ever recognized the desirability of this and in their own fern flora though they may list them all as *Nephrodiums* they retain the section names for them, as *Lastrea* and *Polystichum*. Long before we were willing to separate our *Polystichums* as a separate genus, the British had done so. But while it may be well enough to break up the wood fern group, fern-students have never agreed as to how it should be done. At least a dozen years ago, B. D. Gilbert suggested in a paper presented at the Boston meeting of fern students, that the group should be divided largely according to habits of growth and

that the characters of the indusium be given second place in distinguishing species. L. M. Underwood finally came to hold the opinion that the veins and the fibro-vascular structure of the plants in general should have chief consideration. The latest student to attack the problem is C. Christiansen, author of "Index Filicum," who proposes to separate the species into groups based upon the character of the hairs and scales they bear. Underwood's greatest objection to the indusium as a distinguishing mark was that it is a mere scale growing out of an epidermal cell, but the position of Christiansen is still worse for he relies upon mere plant hairs which are well known to vary in color, size and abundance in the same individual as any but a systematic botanist is well aware. If the problem was only one that concerns the few species in a given region, their separation presents few difficulties, but the more species we have the greater the perplexities encountered. In the tropics one meets with plants that would at once be referred to *Nephrodium* and not far away, others extremely like them but lacking an indusium while still others may have an indusium for a few brief days when the sporangia are developing. All this shows the unreliable nature of the indusium as a distinguishing character and throws us back upon the suggestion of both Gilbert and Underwood that structure and habits of growth are the best guides. Our greatest trouble is that nature did not attempt to make genera and therefore any group that man can devise must have points at which it intergrades with other groups. Many of the differences between fern students are due to the inability to agree upon where the dividing lines should be drawn and in no group is this better illustrated than in the wood ferns.

THE VIRTUES OF POLYPODY.—In the good old days when the “doctrine of signatures” prevailed, medication was not the complex thing it is at present. It has taken a more degenerate age to discover that all the signs with which a beneficent creator was one supposed to have stamped the herbs of field and wood to indicate healing power are purely imaginary. While the belief in these signs prevailed, however, any strikingly marked plant was likely to be seized upon as medicinal. It was about this time that the polypody (*Polypodium vulgare*) a common fern of rocky cliffs, got its medical reputation. One old writer says that the rough spots (fruit dots) on the under side of the leaves is a sign that it is good for the lungs, but a contemporary took another view of the matter and reported that because it had such rough spots on its leaves “it healeth all sorts of scabs whatsoever, by signature.”

HYBRID FERNS.—The recent paper by W. D. Hoyt on the physiological aspects of fertilization and hybridization of ferns noticed in an earlier number of this magazine has stirred up those botanists who view every variation from the normal as a possible hybrid. Hoyt grew the prothallia of several species to maturity and while he secured the entrance of foreign sperms into the archegonia of various species he secured no hybrids although he used in some of his experiments the very ferns reputed to have been hybridized by earlier investigators. His paper has been attacked by R. C. Benedict in *Science* who is inclined to ridicule his conclusions because he took the precaution to have W. R. Maxon identify some of his material. Hoyt began his studies at the New York Botanical Garden but declined to be swayed in his judgment by certain reputed hybrids in the wood ferns which probably ac-

counts for the reception given his paper. Those who advance the hybridization theory to account for every variation in ferns admit that they have no proof of such a condition, but at the same time are inclined to ridicule careful experimental work because it is not in line with their conclusions.

NEPHROLEPIS DREYERII.—It would be a curious set of circumstances that obliged a fern publication to go to press without recording the description of some new "species" of *Nephrolepis*. The latest addition to the list is that which stands at the head of this paragraph. The describer says it is a sport from *N. Bostoniensis* but there is no such species. The correct name is *N. exaltata* and the so-called Boston fern often called *N. exaltata Bostoniensis* is a sport from this species. *N. Dryerii* which, if it needs a name at all, should be called *N. exaltata Dreyerii*, is described as of compact growth and similar in appearance to the form named *Scottii*.

NEPHROLEPIS MARSHALLI.—Elsewhere in this issue we have recorded an additional named sport from *Nephrolepis exaltata* but now that the nurserymen have this species going no one can say where the list will end. Some day it may become necessary to take cognizance of this entire group of variants and we therefore add still another member, *N. exaltata Marshalli* which has sprung from *N. e. Amerpholi* in England. There must now be nearly a score of named forms of this one fern but this is not to be taken as an extreme case of variability in a single species. It is quite likely that any other fern as carefully grown would yield similar returns. Here is work for any species-maker who cares to undertake it.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omissions from this list.

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- JENNINGS, O. E. *Distribution of Certain Plants in Western Pennsylvania*. Fern Bulletin, O., 1910.
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- SMITH, J. D. *A Collecting Trip in Southern Florida*. American Fern Journal, Ja., 1911.
- SPALDING, K. D. *Ferns at Home and Visiting*. illust. American Fern Journal, Ja., 1911.
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- PTERIDOGRAPHIA Fern Bulletin, O., 1910.—*A Correction; Asplenium ebenoides in New Jersey; Distribution of Dicksonia; Meaning of Pilosiuscula.*

EDITORIAL

When it comes to distinguishing between closely related forms or even species, the disposition of the case is likely to be largely a personal matter. As has been noted in this magazine, there was once a time when the *obtusilobata* form of the sensitive fern was regarded as a good species, though we now know it to be a mere ecological form and worthy of a name merely because it can be handled more expeditiously in literature if possessing such a handle. These observations come to mind in reference to Dr. Hill's remarks concerning the plant which we are inclined to call *Lycopodium lucidulum porophyllum*. In the letter that resulted in our asking Dr. Hill to write down his observations regarding the plant, he expressed the opinion that this is a species distinct from *L. lucidulum*. Yet the very characteristics that lead Dr. Hill to think this a distinct species are the ones that incline us to regard it as a mere form. The surroundings of any plant have much to do with its form. Plants accustomed to strong sunlight grow slenderer, and with broader leaves when in shade. Similarly when the so-called shade plants, such as the ferns are exposed to strong light or considerable drouth this is at once reflected in their forms. They quickly become shorter, thicker, yellower, more fruitful and with smaller leaves and fewer serrations. This is exactly what we would expect if the shade and moisture loving *lucidulum* should find itself exposed to considerable drouth by reason of growing on a sandstone substratum. Whether this condition has existed for so long that the two forms are now specifically different and cannot readily be transposed is a matter about which we can only guess, at present. What is badly

needed is careful work in growing these two forms on different rocks until one or the other view regarding them is shown to be erroneous.

* * *

During the past few weeks we have been deeply impressed by the expressions of kindly interest in this magazine that have accompanied a large number of renewals especially from members of the American Fern Society. It is not a light thing to break the associations of ten or fifteen years and one of the reasons for announcing the end so far in advance was to give subscribers time to get used to the change. One subscriber suggests that the magazine may yet take on a new lease of life and to us this seems quite possible. There is no special need for our quitting the field, now, except the fact that the editor has too many other thing on hand. He wants to feel free pretty soon to take up other lines of work. Hustling for copy a few more years is likely to make him a misanthrope. Should we be able to pick out a likely editor from the members of the Fern Society—one who thinks more of ferns than he does of fern names—it is quite likely that the magazine may go on for another twenty years. But twenty years is all the present editor hopes to serve. If the magazine continues after that, it will have to be guided by someone else. However, the editor thoroughly appreciates the good wishes for the success of the magazine expressed by many correspondents and values them high among the returns which the magazine brings him.

* * *

Running a magazine of any individuality is a precarious business if one places the principal value upon the cash returns. For a similar reason the way of the reformer is usually a hard one; not because the senti-

ments he expresses are not correct, but simply because they do not happen to agree with the opinion of the public. As most of our readers have discovered the editor has an opinion of his own, every little while and when this happens it is likely to appear in print. When this first began it was quite a surprise to learn that everybody who subscribed for the magazine did not subscribe to his opinions as well; that, in fact, they had opinions of their own and often diametrically opposed to the choicest sentiments he had expressed. Now and then someone would rise up to remonstrate with the editor and finding him deaf to argument would get peevish and quit the magazine. Really, it seems little short of marvelous to such people how we have managed to get along as well as we have. And some of them refuse to stay with us for such trivial reasons. One individual over in Roxbury and another down on Staten Island quit because we wouldn't issue a bigger index and a lot more have stopped because we persisted in writing editorials. Come to think of it this magazine and the *American Botanist* are about the only two botanical publications that can boast an editor. The so-called editors on most of the others are mere proof-readers and copy-holders—sort of elevated errand boys. We are quite aware that expressions of opinion that amount to anything are dangerous to let loose. Nevertheless we rather like to say what we think. If subscribers do not agree with us, let them set our disagreement down as a case of mental obliquity on our part and forget it. To start a new publication to spite the editor would cost a deal of money and look just as foolish as other attempts in that line.

BOOK NEWS.

The Right Honorable Sir Edward Fry, whose small volume or "British Mosses," written a few years ago, has already gone to a second edition, has just issued a companion volume dealing with the liverworts, under the title "Liverworts; British and Foreign." This little volume, which may best be described as an essay on the liverworts rather than an enumeration of all the species and their descriptions covers seventy-five pages and sells for two and six, net,—about sixty-five cents in our money. To all who are interested in the structure and methods of reproduction in these plants and who want to know where and how they grow, how they are classified and other curious things about them, this little book will be invaluable. The author does not confuse the beginner by an imposing array of scientific terms and yet he contrives to leave him in full possession of the terms necessary for the study of these plants in more technical works. The book is, in fact, another of the many works that will aid in making science attractive. It is published by Witherby & Co., High Holborn, W. C., London.

In the excellent summary of fern literature which Dr. C. Brick sends us annually, we note that in 1907, the latest year for which we have information, an American lead the world with regard to the number of articles published. Germany comes second and Great Britain third, Dr. Christ and Mr. Druery leading their fellows in their respective countries. About sixty American authors are included in the list of writers which contains more than three hundred names for the whole world.

BOTH SIDES OF THE ARGUMENT.

To the Editor of "The Fern Bulletin:"

Your comments on Fern Society matters in the October number seem to me so misleading that I am disposed to present a somewhat differing view.

The conflicting statements made during the last election were such as to arouse my curiosity, and I made it my business to look into the situation somewhat carefully. With all due regard for those who differ with me, I am neither willing myself to believe, or to have it implied without protest, that there are those in our society who are unscrupulously combining or designing to capture its offices, or its funds, or to act contrary to the wishes of a majority of the members so far as those wishes have been ascertained. Nor do I believe that the present officers were elected through unjustifiable procedure and disregard of the Constitution.

No one is likely to question the wisdom of having a nominating board. It is a common practice, it facilitates business and is particularly desirable in a Society holding no business meetings. It is also a common and commendable practice to provide for independent nominations, and our Constitution clearly does so. Article VII, Section 2 reads: "The Advisory Council shall nominate two candidates for each office. This shall not prevent members from nominating or voting for any eligible member not regularly nominated." Nothing could be more specific. Again in Section 5 we read: "In cases where more than two candidates are nominated for the same office and none receive a majority vote, the Council shall elect one of the two candidates having the largest number of votes." Inasmuch as the Advisory Council has no au-

thority to nominate more than two, it follows that if in any election ballots are cast for a greater number, all above two must be other than the two directed by the Constitution to be nominated by the Council. This also is perfectly clear.

Now these provisions of our Constitution are still in force. They have not been repealed by Section 7 which was added to the Article in 1903, and which, I assume was inadvertently omitted when the Constitution, distributed last year, was printed. The added section distinctly says: "Any part of the Constitution not agreeing with this Article is hereby repealed." And it is perfectly obvious that the added section applies solely to whatever outside of Art. VII, may conflict with that article. To attempt to maintain that the new section invalidates any part of the Article itself is absurd in the extreme, and it is difficult to believe that the attempt is made with sincerity.

Now as to the new Journal. You have published your decision to discontinue the "Bulletin" as such, next year. The Society is therefore, if for no other reason forced to make some change. What shall it be? I myself have been very slow in coming to the belief that Society ownership is desirable. Knowing something of the difficulties of such an undertaking, I have hoped and argued for some other way of meeting the situation. Yet it is a perfectly proper matter for the Society to assume, and whatever the difficulties, it will doubtless have its advantages. And by Article VI it is just as clearly within the province of the Executive Council to provide for a Society-owned organ as it is for them to make a new contract or to renew an old one. Such a step to be successful must of course have the genuine approval of the bulk of the membership. That it is so approved appears very clearly I

think, in the postal vote taken about a year ago, when an overwhelming majority of the considerable number voting expressed themselves in favor of it. Assume if you will that the "Journal" may not be destined for the long life which is the glory of the "Bulletin." It will live as long as the members give it proper sustenance. When we fail to do that it will die, as it ought to. In the meantime we may have a pardonable pride in its existence, and I for one shall do what I can to make it worth while, as I believe it should have the cordial support of every member by contribution and by kindly criticism. For while the attitude of the bitter critic and flaw finder is sometimes, though not generally helpful, kindly criticism no less than commendation is in the nature of constructive help, and will be, I do not doubt cordially welcomed by those who are immediately responsible for the appearance of the "Journal."

I heartily agree with you that the business of the Society should be conducted with careful regard for constitutional procedure. It is the only proper way. And I am confident that we may safely believe that the present members of the Executive Council, no less than did their predecessors, have the interests of the Society at heart, that they are not wholly lacking in judgment, that they are not even entirely without experience and that in engaging in what you well know are the sometimes arduous tasks of administration, editing and publishing, they are not acting from sinister motives. I feel that we should not so impugn those who do our work for us.

Perhaps there was a time in your own experience when you could not very lucidly explain the difference between "a fern and a carrot"—although I am sure that you learned much earlier than I, with whom it is

a recent acquirement. So there is hope for all of us if we will diligently apply ourselves. And that surely is one of the things for which the Society exists, to encourage and develop discernment. We need in the Society both those who do not know but who want to learn—and those who know and are willing to teach. But if the Society is to appeal for effective membership, if it is to continue in the line of useful purpose for which it was organized, (thanks to you and your early associates) we should be united in cordial and co-operative fellowship and there should be no room for bitterness. Few of us would care to continue under other conditions.

Two sentences on page 126 which you quote apart from their context from a letter of mine are made, perhaps unintentionally, to do misleading duty. And I look upon the two specific statements next following as quite without warrant. Certainly if the material excellence and dignified character of the "Journal" for January, the first official number, can be maintained, criticism need not be feared from any quarter.

Probably most of us want the few numbers of the "Bulletin" which remain to be issued, and every one will hope that your subscription list will be a long one. But I think it is safe to say that we shall all have a more enjoyable memory of its long and honorable career if its closing numbers shall be marked by an absence of such matter as appears for example on page 127 of the October issue.

Sincerely yours,

Boston, Massachusetts. ROBERT A. WARE.

[It is but charitable to assume that Mr. Ware's position comes from an inadequate conception of the facts. Had he been in the position occupied by the editor of

the *Fern Bulletin* he would know that time and again interested parties have attempted to get control of the magazine in the interests of a kind of nomenclature that is at once provincial, absurd and out of harmony with that used by the rest of the world; and it is a noticeable fact that, whether by coincidence or design, the publication lauded by Mr. Ware adopted this repudiated nomenclature in its very first issue.

It is a well known rule in this world that the first thing to do in putting something over on the public is to control the avenues of publication. Since this could not be accomplished with regard to fern nomenclature there was nothing left to do but start a new publication. The heavy vote in favor of such a course mentioned by our correspondent was exactly 58 out of a membership of 170 and this was secured only after a persistent canvassing of the Society for votes in a campaign in which the *Fern Bulletin*' side of the case was not even mentioned. When the editor asked for space in the Annual Report for an explanation he was denied it, though one of the backers of the new publication offered to get him in for \$5 a page. It may be added that no member of the Fern Society has ever been charged a cent for any explanation he has wished to make in this magazine.

The older members of the Fern Society know that the editor of the *Fern Bulletin* carried the magazine for the first ten years of its existence paying the annual deficit out of his own pocket because no one else was disposed to accept so thankless an undertaking. After much hard work the magazine was established on a paying basis and now Mr. Ware and his friends would push in to avail themselves of the *clientele* thus created. Although not as large as the *Fern Bulletin* the new publication is costing the Fern Society much more

than this publication ever did. And to what purpose? What has been gained for fern study? How does the new publication differ from this magazine except in the matter of nomenclature and the expression of editorial opinion? The Executive Council should not flatter itself that the Society has thus been committed to the "American code." As a matter of fact great dissatisfaction is felt and resignations from the Society are the result.

Nor does Mr. Ware seem to be aware that much more than a year ago, the Executive Council was notified of our intention to cease publication, and that the magazine was then offered to the Society to be run as a separate publication. The consolidated magazine which otherwise we purposed making was offered to the Society at the price it had always been paying. Thus does the contention that the Society had to issue a new publication fall to the ground.

There is scarcely need of discussing that disputed article in the Constitution at this time. Every member can read and judge for himself. The intention of the article is very obvious. The construction placed upon it in former elections has always been in harmony with the opinion from which our correspondent dissents. This opinion has been affirmed in the Annual Reports, and there is extant a substitute amendment which would permit independent nominations but which the maker dared not present for action by the Society. It cannot be denied that the whole article is rather loosely cast and that it offers the possibility that someone may walk straight through it, but such a course was never believed likely until the last log-rolling campaign demonstrated the lengths to which the advocates of the "American code" may go when their absurd nomenclature is at stake. The section which was "inad-

vertently" omitted from the recent reprint of the constitution directs the Advisory Council to nominate two candidates for each office and repeals everything else conflicting with this. The difficult task for those favoring the results of the recent election is to show how a repealed clause is not repealed. Perhaps they can do it, but they haven't done so yet.

The editor admits with becoming modesty that there was a time when he "could not tell a fern from a carrot" but he hastens to add that in those innocent and guileless days he refrained from directing those who did know the difference all of which indicates how greatly times have changed since then.—ED.]

FRAGRANT BRACKEN.—In Eaton's "Fern of North America" a decidedly fragrant form of the common bracken (*Pteris aquilina*) is reported from Illinois. The form must be very rare and so far as we are aware has not been reported in any other fern book though the plant is distributed nearly throughout the world. If any of our readers know of this species being fragrant we would like to hear from them. Like many other ferns, the bracken when young is glandular pubescent and in addition nectaries are produced at the base of the pinnae though there is no known use for them. A large black ant is very fond of this nectar and specimens are seldom free from the insect in spring. In flowers, odor is usually associated with nectar and the fragrant bracken mentioned may have been specimens whose nectar possessed this additional characteristic. At any rate, the subject is worth further investigation.

ALL THE AMERICAN FERN BOOKS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
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Ferns, Waters.....	2.30
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No. 2

The Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1911



The Fern Bulletin



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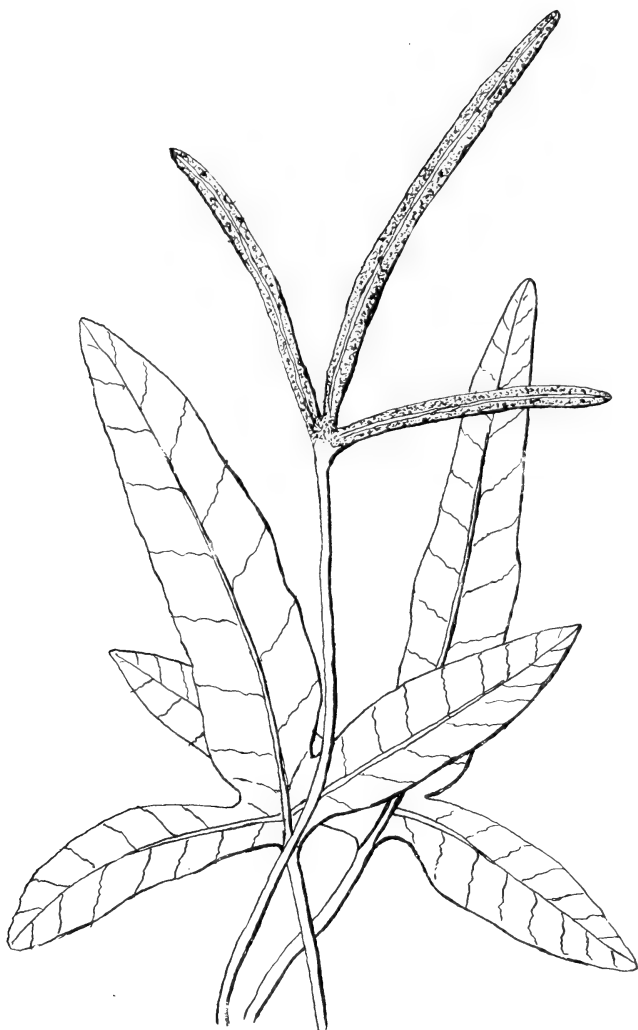
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HEMIGRAMMA LATIFOLIA.

THE FERN BULLETIN

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No. 2

THE IDENTITY OF *ASPLENium* FERRISSI WITH *A. ALTERNANS*.

By W. A. POYSER.

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When Mr. Ferriss first showed me herbarium specimens of *Asplenium Ferrissi* Clute, I was puzzled. The fern seemed familiar, but I could not place it. Upon my return home I immediately referred to my foreign species of *Asplenium* and the first in the cover was the exact counterpart of *Asplenium Ferrissi*, the *Asplenium alternans* of Wallich labelled "Himalayas." A comparison of the descriptions is interesting. Prof. Clute in his description of *A. Ferrissi* (*Fern Bulletin*, January, 1908) says, "Rootstock small, erect; fronds oblong-lanceolate, short-stalked, spreading, 8 to 15 cm. in length; 2 to 4 cm. in width, tapering from above the middle to the base, thickish, dull green in color, nearly pinnate below, pinnatifid in the upper portion; divisions of the blade alternate, spreading or ascending, rounded in small fronds, longer and obtuse in larger ones, the margins entire or wavy; sori heavy, elongated, 5 to 10 on a segment, the basal ones nearly parallel to the mid-rib; indusium thin, nearly disappearing in old fronds, veins free, one to three times forked."

Hooker ("Synopsis Filicum") describes *Asplenium alternans* Wallich as having "Stipes tufted, 1-2 inches long, clothed with linear scales; frond 6-8 inches long, 1-1½ inches broad, lanceolate-oblong, cut down into numerous bluntly rounded lobes on each side, which

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reach very nearly down to the rachis, the lower growing smaller gradually and sometimes distinct; texture sub-coriaceous, both surfaces are opaque greyish-green; veins free, subflabellate; sori copious."

It will be noticed that in the description of *A. Ferrissi* the scales of the stipe are not mentioned, though they are present and under the microscope are indistinguishable with those of *A. alternans*. Hooker does not note the lobes of the blade, as alternate as does Clute, though Wallich probably based his name on this characteristic. *A. Ferrissi* impressed me as having somewhat yellowish rather than dull-green fronds, though age probably effects a change in color. "Opaque greyish-green" and "dull green" may mean the same. A further comparison of the two ferns readily proves them identical.

Though *A. Ferrissi* is thus not a new species, the discovery of a fern heretofore known only from the Himalayas and Abyssinia, in even such a land of unique discoveries as Arizona, must be considered as of more than usual interest and deserving greater study than a new species. We expect Mexican species to cross our border, but scarcely one of Asia and Africa.

Unfortunately, my library gives me scant information as to the habitat of *Asplenium alternans*. According to Hooker it ascends the northwestern Himalayas to 6,000 feet and I would place it in about 35° North Latitude. Schimper gathered it in Abyssinia and as a mountain species I would say at 5° to 15° North Latitude, and probably ascending higher than in India, due to the proximity of the equator. Williams ("Select Ferns and Lycopods," London, 1873) suggests that it may, in many localities (England?) prove hardy, and further states "A good kind for the crevices of rocks in the fern house." These comments

would seem to place it in a habitat similar to that preferred by *Asplenium pinnatifidum* Mett. or *Asplenium Bradleyi* Eaton which, while not averse to some moisture and shade, can get along somewhat exposed. From the original description of *A. Ferrissi* I would consider that it grew under similar conditions in about 31° 35° North latitude at an elevation of 7,000 feet, though surrounded by a country more arid than the Himalayan region. It will be noted that it occurs several degrees farther south in Arizona than in India.

It is difficult to theorize on such an anomalous distribution. The occurrence of *A. alternans* in Abyssinia might be considered as evidence of a once more general distribution; in Arizona it may seem to be evidence that under similar conditions similar species may in the course of time be evolved in widely separated localities. Or, we may consider other agents of plant distribution. Since the appearance of plant life upon the earth, the meteorological factors, wind, moisture, heat and light have been at work. At various times and in many parts of the earth their work has been assisted, interrupted or rendered nugatory by geological agents. Seismic upheavals have imposed tall mountain ranges; sinkings have caused deep wide oceans beyond which species could not migrate and which to some degree isolated species, sometimes genera, families or even tribes. A gigantic upheaval may account for the presence of a number of common American ferns in Japan such as *Adiantum pedatum*, *Onoclea sensibilis*, *Botrychium ternatum* and others. May not the Japanese *Camptosorus Sibericus* and our *Camptosorus rhizophyllus* have had a common ancestor? Vicarious endemism? The evident affiliation of North America and Asia is further upheld by the remarkable pairing of western

North America and eastern Asia in the display of certain genera of Gymnosperms, no less than six genera being common to these two regions and occurring nowhere else. A similar pairing may be noticed between South America and the Australasian region. From the facts I have cited it will be understood that I am inclined to regard the occurrence of *Asplenium alternans* in Arizona as evidence of a greater or more general distribution of a parental form in the past and an unusual persistence of the descendant in widely separated localities. The genus *Asplenium* has had a long life period upon the earth, having appeared during middle Jurassic time.

Hammond, Ind.

THE FINDING OF ASPLENIUM ALTERNANS.

BY JAMES H. FERRISS.

This *Asplenium* was found in the autumn of 1908 in the Huachuca mountains Cochise county, Arizona, probably thirty miles north of the Mexican line. At the time L. E. Daniels of the Indiana geological survey and I were boarding at the Berner conservatory in Ramsey canyon (Hamburg P. O.) and in search of land snails had crossed over to Tanner canyon, about three miles westward, keeping our course as near as convenient at about 7,000 feet altitude. Between branches of the Brown and Tanner canyon are two ranges of high cliffs, one above the other; perhaps there are more cliffs, but at that time we were more concerned with trails and a direct route from Berner's to the Tanner canyon than in the topography. We had lost our way once before on this route and for safety had been driven to a longer trail on the plain below which took us far into the night to get home.

In these cliffs were narrow crevices and upon a former occasion I had found a plant of *Nephrodium patulum* here. In an attempt to find the same crevice we climbed into another where the new *Asplenium* grew, in company with *A. parvulum*, as I now remember. These crevices run northward and vary from four to thirty feet in width with walls running up from fifty to one hundred feet. At the lower end the ferns grew on the benches in the accumulations of leaf mold and sand, sheltered under the overhanging rocks from sun and wind. I brought home seventy-five living plants and they grew nicely in our greenhouses, except when the fumigater was abroad. Our houses are in a new commercial nursery and help and glass are both crowded in seasons of the white fly and red spider. We now have only one sturdy plant and this is growing out side on the north side of the house during the summer vacation and doing well. Many of the Arizona ferns grow in the bright sun light; for example, the *Pellacas*, *Gymnogrammas*, *Cheilanthes* and *Notholaenas* but the new fern grows in a situation similar to wood ferns.

A good plantation of young plants were left and the location was well adapted for the growth from spores. Expecting to raise a lot of them in our greenhouses I only preserved one dried specimen entire. Thus the location is described minutely in the hope that other collectors may find the colony. I have collected during seven of my vacations in Arizona and hope to collect there many more, but it is a big country, counting the hills and there are so many places to go to that I may never return to the Huachucas. These and the Chiricahua mountains are the best for ferns I have so far visited in Arizona. Perhaps there are other ranges as good and perhaps there are other colonies

of the *Asplenium* but so far they have not been reported. In truth there are an even dozen reported from that territory counting the sub-orders, that I have not found. As before stated it is a big country and it is also a little difficult to move around from range to range. Then too the rare ones apparently dwell in the wildest and least accessible places.

Joliet, Ill.

THE DISTRIBUTION OF *ASPLENIUM ALTERNANS*.

BY WILLARD N. CLUTE.

Before the fern known as *Asplenium Ferrissi* was described as a new species from Arizona, the possibility of its being a Mexican fern was carefully investigated. A specimen was sent for name to one of the large Eastern herbaria making something of a specialty of these plants, and all the available literature and specimens gone over without results. Only then did we venture to present it as new. It did not occur to any of those who saw the fern that it might be a species of far off India. In fact, it is easier to believe, or to make others believe, that it is a new species than it is to convince them that it is a plant whose natural haunts are more than ten thousand miles away. At the time it was collected, specimens were sent to several of our prominent fern students and none recognized it.

Of its identity with *Asplenium alternans* there seems to be no doubt, but in thus settling one question we raise a much more difficult one, namely, how the fern happened to grow where it does. There seems to be very few cases on record that approach it in mystery. Here and there on the globe, fern species have been found in very restricted habitats. The case of

Trichomanes Petersii in our own country may be cited as an example, but very rarely do we find an outlying colony of some well known fern at any great distance from the center of distribution, and there never has been, nor will there ever be a record of a greater separation between two colonies of plants for the simple reason that the earth is not large enough to allow the distance to be greater.

Our own fern flora, again, affords several illustrations of ferns separated by wide stretches of land or water from others of their kind, but most of them occur in such a way, or are species of such affinities that the method of their distribution is not difficult to make out. Leaving aside those cosmopolitan species that are spread nearly throughout the world, we find that all the others are limited on all sides by temperature, moisture or shade or all three combined. Tropical species are limited by low temperatures, while northern ferns are affected by extremes of heat. The Arctic species may extend equatorward along mountain tops which make a congenial habitat and Tropical ferns may extend toward the poles where warm winds sheltered valleys, or mountain barriers to the cold make a favorable locality for growth.

Thus we can account for the occurrence of *Adiantum Capillus-veneris* in Great Britain and in Dakota in our own country. Nowhere else in the United States does the venus hair fern go north of Kentucky, but certain hot springs in Dakota make a habitat in which it can exist.

In the case of several other ferns that are common to North America, Europe and Eastern Asia, such as the forked spleenwort, green spleenwort and rusty woodsia, the distribution is easily explained by the fact that they are boreal ferns and extend southward

wherever there are congenial dwelling places.

There still remains, however, the case of the harts-tongue, which up to the present has been the most puzzling of any in our flora. Found only in a limited region in Central New York, a still more limited station in Tennessee and a few rather more extensive localities in Canada, it does not occur again for three thousand miles. The most plausible explanation of such distribution is that at one time the fern had a much wider distribution, and has since died out at the intervening points.

None of these explanations, however, seem to fit the case of *Asplenium alternans*. In all the other species mentioned, the specimens have naturally a wide distribution and this of itself makes it easy to assume a further extension of their range. But *Asplenium alternans* is not in this class. It appears, indeed, to be rather common in the Himalayan region. Hope who gives its distribution as from Afghanistan and Northern India to Assam, at elevations of from 4,000 to 8,000 feet, marks it "common" or "profuse" in several stations, but the fact remains that the fern has not the general distribution of the other ferns, whose widely separated colonies have been mentioned and it does not seem at all likely to the writer that the ferns found growing in one small locality, in Arizona, in fact, in a small portion of a single glen, are the remnants of a once more widely distributed group on this side of our planet.

There still remains two other theories that might account for its presence in our Southwest. A certain school of botanists have frequently favored the idea of a multiple origin for various species. In this way they account for species that are common to both sides of the Atlantic or common to our Atlantic seaboard and

Japan. The theory is that in the process of evolution, the stock from which a modern fern came, might give rise to exactly the same form in widely separated regions if the physical conditions were the same. It is as if our widely distributed bracken should produce the same spot in both Hemispheres. It is well known that our lady fern, ostrich fern, and royal fern present certain small variations not seen in the European plants and it has frequently been proposed to consider them separate species. Those who believe the ferns of the two regions to belong to one species, account for their differences by differences in environment, or else by this theory that the two have had a separate origin. Considering all the surroundings, however, it does not seem probable, that this theory will fit the case of *alternans*. If it were invoked to explain its presence in Arizona the absence of the fern from other locations in the same region must also be explained.

Last, and most likely of the theories advanced to account for the fern's occurrence, is that the colony has arisen from wind-blown spores. This is, indeed, the first explanation to come to mind in this and similar cases, but while considering it, it is well to remember that for some reason ferns seldom spread into far off regions in this manner. Within less than two hundred miles of Florida, there are five hundred species of ferns, and there are twice as many within a thousand miles, yet they do not gain a foot hold in the latter region although conditions there are seemingly as favorable as anywhere else. In more northern regions we do not find the adderstongue, the narrow-leaved spleenwort, the fragrant fern or Goldie's fern in every locality that is suitable, though their spores have doubtless been showered upon such regions annually for ages. In the case of *Asplenium alternans*

the difficulty seems almost insurmountable since the immense distance enters into the matter. Fern spores are light, however, and capable of remaining in the air a long time. Nevertheless it must have been one chance in many millions that enabled a single spore, after travelling half way around the earth to find the exact combination of soil, moisture, shade, temperature, climate, and elevation to allow it to establish a colony.

FERNS OF SAN DIEGO COUNTY, CALIFORNIA.

BY LAURA F. KIMBALL.

It may interest the readers of the *Fern Bulletin* to have a short account of the ferns of San Diego County, California, as collected by me. (There are other kinds growing in the eastern part of the county, about 60 miles from here, that I have never collected). Our fern season is from February to the middle of May, varied as we have more or less rain.

There are four stations where we find quite a number of ferns, and a few others grow by the roadside as we go to these places. The stations are "Old Mission Dam," about twenty miles from National City, San Miguel Mountain 12 miles, Otay Canon twelve miles, and Sweetwater Dam seven miles. The ferns found by visiting the four, are as follows: *Polypodium Californicum*, *Gymnogramme triangularis*, *Gymnogramme triangularis*, var. *viscosa*, *Notholaena Newburyi*, *Adiantum emarginatum*, *Chilanthus Californica*, *Cheilanthes Clevelandii*, *Pellaea ornithopus*, *Pellaea andromedaefolia*, *Dryopteris rigida arguta*, *Asplenium vespertinum*, *Selaginella Bigelovii*, *Selaginella cinerascens*. I found *Azolla filiculoides* Lam. not far from the base of San Miguel Mountain

in still water in a pond of the Sweetwater river, also in damp land near there, and at "Old Mission" Dam, in still water east of the dam. I received specimens from Miss Evelina Cannon of San Francisco by which I identified it. Once when my brother and I were on our way to San Miguel Mountain, I noticed a small flower that was new to me, and as I picked it, I found under my hand an *Ophioglossum*, which I learned from Mr. Samuel B. Parish and Mr. George E. Davenport, to whom I sent specimens, was *O. Californicam*. I got a number of specimens at the time, but was careful to see there was plenty left, as it was the only station I knew for the fern. I have visited the place since, and my brother has hunted at other times but those we found at first are all we have been able to collect. It seems strange when I have collected ferns here since 1878 that I have never found it but once.

At another time we found not far from the road *Notholaena cretacea*. This is rare here, the only other place where it is found being at Spring Valley, on our way to Old Mission Dam, about three miles distant. As my brother and I did not choose to have the small station we found entirely collected, it is so near the wagon track, we have kept its location to ourselves.

I have hunted in vain for the *Pilularia Americana*. I once found two kinds of *Equisetum* which I sent Mr. Alvah A. Eaton. They grew on the bank of the Sweetwater river, about 3 miles from my home. Mr. Eaton wrote me they were those he had named *Equisetum Funstoni nudum* and *E. F. caespitosum*. The land has since been cleared and the station lost. I have not found them elsewhere; although they are found in northern parts of the State.

I once noticed in a friend's parlor a box of beauti-

ful *Adiantum capillus-veneris*. She found them under the flume that brings the water from the mountains to the City of San Diego. We went where they were found, about fifteen miles from here. That was in 1902, they have now grown along toward San Diego, eight miles from where we found them first. The land, before the flume was made was dry, sandy, and not at all suited for that kind of fern. Now where the flume comes near enough to the ground to afford the required shade, it is green and beautiful with the ferns, in all stages from a tiny leaflet to those a foot or more in height. I filled several boxes with roots to take home and found them evergreens and easy to cultivate. I have transplanted all the kinds that grow here, and enjoyed watching their growth.

Some of the members of the American Fern Society have written me, that in their opinion I should write for the *Bulletin* some of the items that I have sent them of what I have found out to be errors. I will do so, but it may be you will not care to print them. I can see no reason for the name Mr. A. A. Eaton gave the fern from Fresno County, California. It is exactly like our *Cheilanthes Californica* as near as I can tell from the discription and cut in the *Bulletin*, and Mr. Benj. D. Gilbert wrote me he could see no difference. I sent him a lot of small *C. Californica* for study in reference to the subject. To me it is confusing to call it by a new name.

Another mistake is in *Pellaea andromedaefolia* f. *rubens*. The difference is, that the mature fronds turn dark red, while the type has mature fronds of yellowish green. I have fronds with both colors on the same frond, and you often see intermediate ones. If any one writes and wishes me to send both kinds, it is im-

possible for me to separate them, when there is, in my way of thinking but one kind. I have grown them for many years, so have had a good chance to observe their peculiarities.

The fern that varies the most with cultivation (and in its wild state too) is *Pellaea ornithopus*, I think if it could be studied more, it would be found, there is more than one kind, but I have not the chance to transplant both large and small plants and study them as other work prevents. I intend to write a little to the *Fern Journal*, and let them know there are *some places* in in California where you can get more kinds of ferns than the article in the last one would indicate. I have found forked ferns of each kind I collect. Of the ferns that grow here, the *Ophioglossum Californicum* is the rarest, and the bronze-powdered *Gymnogramme triangularis* is next, as you only find a root once in a while growing among the other ferns, and I have found them alone but there is no definite station for them. *Notholaena cretacea* also is not abundant, and I do not press many *Dryopteris rigid arguta*. The other kinds I collect when I have a chance to visit the places where they grow. Some years I do not go to all the stations and other years have been to some of them twice. I had about 40 specimen-pages of the kinds not found in California when I joined the "Fern Chapter." The most of my collection of over 300 kinds of native forms, I have obtained since, by exchange with the members of the American Fern Society. I have one disadvantage; since I have all but the newly discovered, or rare ones of the United States in my collection, I do not care for duplicates of the more common kinds, as I am trying to get the very finest collection of ferns I can for their beauty, and cannot

use them to send to others who have the same kinds themselves. I presume it would be an "ad" if I said I am willing to sell mine if any one wishes to buy.

I have written in a book the names of the ferns given in the list you published in the *Bulletin* and use it for a check-list adding all new ferns as I read of them. It is a great help as no one list has them all. I also took your advice and mounted an "Oh! My! Collection." It is beautiful. With a hope that this may help some other collector I will close.

Nationa City, California.

[With regard to the form of *Pellaea andromedae-folia* named *rubens*, Eaton's "Ferns of North America" ventures the opinion that the color is due to the sunlight, plants in shade seldom if ever developing it. If western readers can add to this account, we shall be glad to hear from them.—ED.]

HEMIGRAMMA LATIFOLIA

BY WILLARD N. CLUTE.

The farther one penetrates into the warmer regions of the earth, the greater always becomes his perplexity in the matter of fern genera. The changes that nature rings upon a few type arrangements of veins, sori, and pinnae are endless and task to their utmost the abilities of the veteran fern student. To add to his troubles, Nature has never been particular to make distinct species—the species conception is a man-made idea—and one form grades into another so imperceptibly that a given plant seems to have equal rights to a place in any one of half a dozen genera. The discussions that occasionally rage among the systematists therefore are not altogether without cause though in

the end, when all is regarded as settled, some one is as likely as not to discover new evidence and the battle begins all over again.

Something of this nature is concerned with the subject of our sketch. It is not a new species, but those who look for it in standard fern books under the name we have used, will be disappointed. At various times it has been considered a species of *Leptochilus*, *Hemionitis*, *Gymnopteris*, *Dendroglossa*, *Acrostichum* and *Polybotrya* and when *Tectaria* was recently made into a genus it temporarily found a place in that. Latest of all, it was made the type of a new genus *Hemigramma* by Christ and here it remains for the present. Specifically, at first, it was known as *Zollingeri* but *latifolia* is said to be older and of course will be used until somebody digs up something more antique.

Of itself, the fern is an interesting species with the trifoliate leaves characteristic of one large section of the wood-fern family, especially the species *Aspidium trifoliatum* which at one time occupied the same genus with it. The sterile fronds are rather broad and thick with little to suggest a fern about them, and grow on short stipes from a rather stout and creeping rootstock. The fertile fronds would scarcely be thought by the uninitiated to belong to the same plant. They are slender brownish tridents rising high above the sterile fronds and when mature are so thickly covered on the under side with spore cases, as to completely obliterate all trace of separate sori. If one were given only a section of ripe fertile frond he would unhesitatingly call it an *Acrostichum*. The veining, however, in this genus is different. In *Hemigramma* the veins anastomose several times and in arrangement have a superficial resemblance to those

of the genus *Meniscium*.

The species from which our illustration was made was collected by Mr. D. Le Roy Topping in Luzon, Philippine Islands where it appears to be not uncommon. It is also found in some of the islands of the East Indies.

WALKING FERNS.

BY ADELLA PRESCOTT.

It was on a sultry day late in June that I first made the acquaintance of the walking fern (*Camptosorus rhizophyllus*) in its native haunts. A lady who lived in the locality where they grew kindly offered to act as guide for a party of whom I was one and ignoring a sign-board which said "No trespassing" we followed a trail along the side of the ravine until we reached the tumbled mass of rocks where grew the ferns. We were not the only ones who ignored the sign, for the wayside was adorned at irregular intervals by tramps in various attitudes of repose and it seemed to me quite fitting that the path leading to the abode of the walking ferns should be a favorite with those who make walking an occupation. One of them had removed his shoes and sat on a log with both stockinged feet firmly planted on a bed of moss quite as if he were waiting for them to take root, and I confidently expect when I go that way again to find three tramps growing where but one grew before.

The walking fern is most at home on limestone rocks and while it is liable to be abundant where found at all yet it may well be counted among the rare ferns, and it looks so little like most other ferns that one would hardly suspect its identity if he had no previous knowledge of it. It has a short dark root-stock, and its narrow fronds, eared or heart-shaped at

the base and tapering to a long thread-like tip usually lie nearly flat on their mossy bed tracing quaint patterns in plain green on the shaded velvet of the moss.

The sori are linear suggesting the spleenworts and are scattered irregularly on the back of the frond, but the walking fern, like a few others, does not depend entirely on spores for its perpetuation and increase but thrusting its slender frond tip into the soft moss, takes root, forming a new plant which in its turn steps forward until in a favorable locality dense colonies of sturdy plants are formed, two or three generations being sometimes found still connected with the parent plant.

Having first heard of this fern at Chittenango Falls it had always been associated in my mind with the mist and spray of water falls and I was surprised to find it growing high and dry on rocks with but a scanty covering of moss far above the little stream that flowed in the bottom of the ravine. It was so plentiful that I gathered several specimens both for my garden and herbarium with a clear conscience but owing in part to the drouth of the previous summer the plants lacked the vigor of those growing in a more favored spot. A few really fine plants were found where a little deeper and damper soil was available, but it seemed to me that only the dense shade which conserved the moisture of the small stream below saved them from extinction.

Returning by another path we found some fine plants of the long beech fern and most unexpectedly (to all but our generous guide) the adders-tongue, a large number of tiny plants being found in a dry pasture on the hillside. Do you wonder that it was a happy, if tired, woman who slept that night only to dream of ferns?

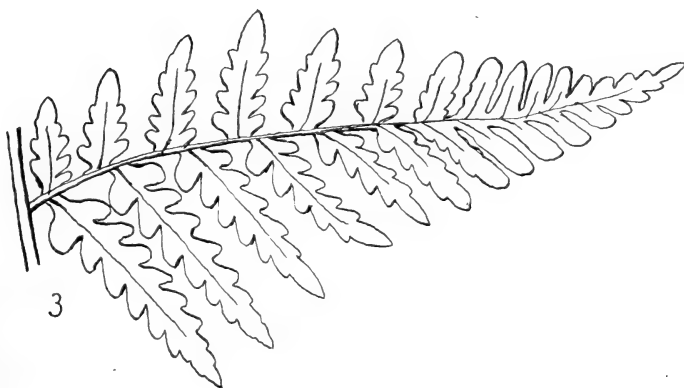
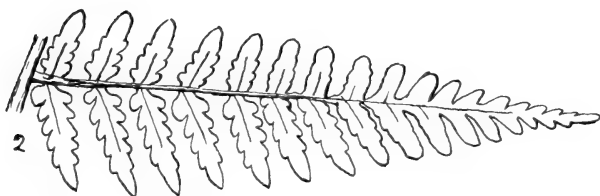
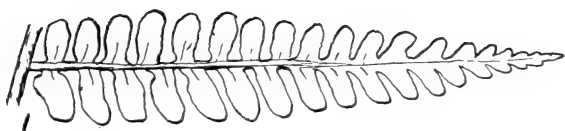
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RARE FORMS OF FERNWORTS,—XVIII.

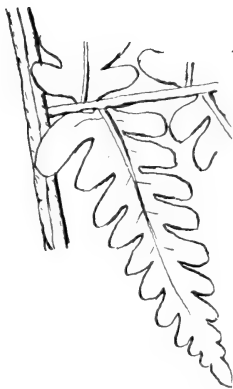
THE FORMS OF THE MARGINAL SHIELD FERN.

The marginal shield fern (*Nephrodium marginale*) is one of the most abundant and widely distributed ferns in Eastern North America, and grows in a variety of habitats besides the one which it prefers, but with all its range of habitat, altitude, longitude and latitude it maintains its form practically unchanged. Many species of less promising appearance—such as the polypody and harts-tongue—have far exceeded it in the number of varieties produced in the wild, while under cultivation a still greater diversity of form occurs. As in practically all the ferns of the world, forked fronds may be found if one searches long enough, but even these are by no means as abundant as in other well known species.

The varieties of the marginal shield fern thus far described have all clustered around the cutting of the pinnules, and may almost be set down to the vagaries of luxuriant growth processes. We see analogous cases in the leaves or vigorous young twigs of many flowering plants, where there is a tendency to a deeper cutting of the margins. Ordinarily the fern is pinnate with pinnae that are pinnatifid in the upper portion and inclined to be pinnate below. The pinnules, themselves, are usually short and blunt-ended with a wavy margin that faintly indicates the point of departure of the varieties. This is the form illustrated in Eaton's "Ferns of North America" and is illustrated herewith at 1. As we have indicated, the described varieties are all mere stages in more luxuriant and deeply cut specimens. When the wavy margins give place to decided ear-like segments, the writer's form *bipinnatifidum* results. A pinna is illustrated at 2. The variety *elegans*, of Robinson is so



far as we can judge from descriptions, a still more luxuriant form which is nearly thrice pinnate, the secondary pinnae being much like the primary pinnae of typical forms. A pinna is shown at 3. Last in the series is the "variety" *Traillae* which attains the height of three feet or more and is broad in proportion, with the basal pinnae inclined to be triangular. The secondary pinnae are deeply pinnatifid throughout the frond, and the largest are four or five times the size of those in the normal specimen. One of the secondary pinnae is illustrated here. All the pinnae illustrated were drawn, natural size from specimens furnished by Mr. W. A. Poyser, and have been reduced one fourth in making the illustration.



Aside from their interest to the student of plant forms, these cut-leaved fronds are of much greater beauty than the usual specimens and therefore more desirable for cultivation. When abnormal fronds of this kind are found, they are usually carried off to enrich someone's herbarium, but if committed to the care of a good nurseryman might be endlessly multiplied and form choice specimens for the fern garden. It may be doubted, however, whether any of these forms are fixed. It is probable that in situations less favorable to luxuriant growth, they would revert to the type.

PTERIDOGRAPHIA.

FORKED LIQUORICE FERN.—The natural venation of ferns follows a forking pattern and it is not surprising that forking fronds now and then appear; in fact we may safely predicate forking fronds in any species. As further evidence of this fact, we have recently received from Mr. Wilhelm Suksdorf fine specimens of forking liquorice fern (*Polypodium falcatum*) which were collected near Bingen, Washington. Five forked fronds were found at one time. During the previous year a single frond was found at the same place which inspired the search the following year. With the polypody Mr. Suksdorf included specimens of the matricary grape fern (*Botrychium matricariaefolium*) collected in the state an interesting reminder of the existence of this small member of the Eastern flora in the Northwest.

SEX IN THE OSTRICH FERN.—Writers on the prothallia of ferns when addressing audiences of systematic botanists are inclined to pass over the subject of the sex-organs with the statement that the heart-shaped prothallus bears the antheridia and archeogonia, but while this is true for some ferns it is by no means the rule in the fernworts. Some species practically always have dioecious prothallia the archeogonia being borne on one kind and the antheridia on another. Since the young fern is likely to need considerable food before becoming established, it is quite appropriate that the archeogonia are always borne on the best nourished plants. So closely connected are sex and food that it is possible to turn potentially male prothallia into female by proper feeding. The ostrich fern (*Struthiopteris Germanica*) is one of the species

with dioecious prothallia and recent experiments have shown that the female gametophyte or prothallus can be made to produce antheridia. At the meeting of the Botanical Society of America in Minneapolis last December, F. C. Newcombe announced that he had been able to perform the reverse of this and produce archeogonia on male prothallia.

DEATH OF J. H. HART.—John Hinchley Hart, F. L. S., formerly superintendent of the Royal Botanical Gardens at Trinidad and well known for his work in tropical botany, died on Feb. 20, 1911 at the age of 64 years. Mr. Hart was born in England but began his botanical work as a landscape gardener in Nova Scotia in 1872. From there he went to Jamaica to take charge of the ground at Kings House, the Governor's residence and later upon the departure of Sir Daniel Morris, he acted as Director of the public gardens and plantations of Jamaica until his transfer to Trinidad in 1887. In 1908 he retired from Government services, but continued to busy himself with botanical matters among which was the editing of a volume on the ferns and fern allies of the British West Indies and Guiana, a task which he was particularly well fitted to perform.

CAMBium IN FERNS.—In all woody stems that increase in diameter from year to year, there is a layer of growing cells between the bark and wood that annually adds new material to both these tissues. This layer of cells is called the cambium layer. One great group of flowering plants, called the monocotyledons, lacks this cambium, and it is also absent from the modern ferns and their allies with the exception of some of the species of *Isoetes* and here and there in *Sclaginella*. In the ancient fernworts, however, it was

pretty generally present and resulted in the production of massive trunks in many species closely allied to modern genera as well as in other more archaic forms that once inhabited the earth. Our present tree ferns may rise to heights of twenty-five feet or more, and live for a long time, but the trunks do not increase in thickness because cambium is lacking. An apparent increase in size, may sometimes be noted, but this is due to innumerable rootlets that make their way downward from the bases of the fronds and often completely invest the trunk with a shaggy coat.

FRAGRANT BRACKEN.—In response to our request for further references to fragrant bracken (*Pteris aquilina*) Dr. H. Woynar of Graz, Austria sends us a reference to Lowe's "British Ferns" page 146 in which it is recorded that in parts of Monthshire, England where the brake or bracken is cut for straw "the scent when freshly cut is even more powerful than that of *acmulum*." The *acmulum* here referred to is *Nephrodium acmulum*, the hay scented fern of England. Here we have additional evidence that the bracken may on occasion be fragrant; it now rests with the American fern students to determine how widespread is this fragrant form and how abundant. It may be noted in this connection that the hay-scented fern of England and the species called by the same name in this country, are not the same. Our hay-scented fern is *Dicksonia pilosiuscula*. It was probably named for the English species with the same lack of originality that induced the early settlers to call our common migratory thrush, a robin, and our species of *Caltha* a cowslip. In any case "hay-scented" is a misnomer. If there ever was any hay that smelled like *Dicksonia* it was because the fronds of this fern were mixed with it. To call the fern hay-scented is

a direct inversion of the facts, and performs that disagreeable operation known as "damning with faint praise" so far as the fern is concerned.

ABNORMAL LYCOPODIUMS.—We are indebted to Mr. G. W. Martin for a fine series of specimens illustrating the phases of variation that occur in the form of *Lycopodium alopecuroides* f. *adpressum* known as *polyclavatum*. In this there are from two to half a dozen or more spikelets borne on a common stem in place of the single fruiting cones of the form *adpressum*. It is apparently only a fasciated form, such as often occur in the flowers of Angiosperms, but is of special interest here, since similar phenomena are so rare in the fernworts. There does not seem to be a single recorded instance of fasciation in other forms of *Lycopodium* though those which normally bear a three or four-branched fruiting cluster ought to be good subjects for exhibiting the abnormality. Mr. Martin's specimens come from Metuchen, N. J., and thus extend the recorded range of the form. Since the first plants were found on Staten Island, New York, they have been reported from Hartsville, South Carolina, and Sanford, Florida. Doubtless it may be found at other points if a careful search is made.

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EDITORIAL.

The printing company that manufactures this magazine has been bothered with a succession of fires that have recently been shown to be of incendiary origin. While the January issue of the *Fern Bulletin* was in press, a fire delayed it nearly a month, and later an edition of *The American Botanist* ready to be mailed was entirely destroyed and had to be re-printed. Still later, just as this number of *Fern Bulletin* was ready for printing the ninth and final fire put the presses and machinery completely out of business and tied up everything until the machinery could be rebuilt or new machines purchased and installed. The company is now in a fire proof building and we hope will be able soon to catch up with our dates.

* * *

It begins to look as if we had spoken too soon regarding the end of this journal. There has been so many objections to its demise registered that it is quite likely that it will take a new grip on the situation at the end of twenty years and start in for a run of another twenty. One circumstance, however, is unchanged: the editor is going to quit at the end of 1912 no matter what happens. We think we know where to get a first class successor and if the arrangement we now have in mind is made, our readers may hope yet to see a better magazine than has thus far been issued. Meanwhile, we hope our readers will continue to favor us with articles and subscriptions.

* * *

In the good old days before the Fern Society decided to own its official organ, certain members severely criticised us because our magazine did not appear on time. Now that these same critics have begun to practice amateur journalism with funds bor-

rowed from the Society or begged from susceptible friends, the shoe is on the other foot. Not a single number of the new *American Fern Journal* has appeared on time and there are no indications at present that there will be much of a change in this respect. In one other matter the new publication is inferior to the old. For eighteen years the Fern Society ran its magazine without assuming the role of a mendicant but as soon as a change to a new publication was made, an urgent call for funds was issued. If the Fern Society cannot conduct its publication without soliciting contributions, it had better go out of business. As for the make-up of the new publication, the fact that it is a duplication of *The Fern Bulletin* has not escaped notice. A writer in *Science* observes regarding it, "While the *Fern Journal* does not cover exactly the field already occupied by the *Fern Bulletin*, published by W. N. Clute, the latter being much less technical, it must be confessed that they are rather too nearly alike and one is led to wonder whether there is room in this country for two journals devoted to such a small group of plants as the ferns." Of course there is not room but nobody need expect us to move along just a little so that the highly unnecessary interloper may get a foothold.

* * *

At a congress of botanists from all parts of the world held in Vienna in June, 1905 certain rules were agreed upon to govern the application of scientific names to plants. This was not a snap convention. The suggested rules had previously been printed and sent to those who attended the congress and there was a studied attempt made to make rules that would result in a uniform and stable nomenclature. Everybody with ideas to suggest was given a respectful

hearing and then rules, since known as the Vienna Code were adopted section by section. At this meeting advocates of the nomenclature favored by a few New York botanists and their friends in the government service were present and spoke at length in favor of their schemes, but it was soon discovered that the proposed ideas would not conduce to stability of names or uniformity of nomenclature and when the vote came the plans of these advocates were rejected. In the adoption of the Vienna Code, botanists saw the beginning of that uniformity in the names of plants so long desired, and although some of its provisions were not satisfactory, they accepted the Code and in the five years that have elapsed they have seen no reason to regret their action. Not so the American objectors: finding themselves outvoted at Vienna they promulgated the "American Code" a sort of nomenclatural make-shift for our small part of this planet. Of course no foreign scientist takes such a "code" seriously but some of our native botanists with that spirit of jingoism that makes us braggarts at home and blusterers abroad, have attempted to unite the students of this country in a solid opposition to the code followed by the botanists of other nations. As a first step to this attainment, there has been an effort made to secure control of the various botanical magazines, since if it could be made to appear that everybody was in favor of the "American Code," objection could be more easily stifled. To these schemes *The Fern Bulletin* has ever turned the cold shoulder, though more than once solicited to join the movement. Recently a few fern students by manipulating the voting machinery of the American Fern Society have succeeded in an apparent effort to secure the backing of the Society for the "American Code." This is at the root of the scheme to found **an** official organ.

Already it is plain that fern students are to be schooled in the new names. In the publication *Nephrodium* has already been replaced by the distasteful and altogether unwarranted *Dryopteris*, while the name *Cystopteris*, of world-wide use has been abandoned for the absurd *Filix*. Now that the step has been taken, it must give the great majority of the members the American Fern Society a feeling of chagrin to discover that they have been used as cat's-paws to rake the chestnuts of the "American Code" advocates out of the fire. And what a spectacle is presented by this whole nomenclatural discussion! A lot of grown up men wrangling about the christening of a plant and some of them doing nothing else but splitting hairs about it; making of themselves a new kind of "Old Mortality" in an endeavor to secure credit for some dead-and-gone plant collector, who during his life was blissfully unconscious of the point at issue and being dead cares nothing for it now. No wonder that the general public regards a botanist at a sort of anthropological freak and something hardly to be treated seriously.

* * *

The present officers of the Fern Society are out with the suggestion that "perhaps it would be better to have the officers serve a longer term and avoid having the elections recur so often." This is the idea that always gets into the heads of office holders. They cannot see why anybody should not be satisfied to have them serve always. Each feels that it would be a fine thing to have a king, if he might be entrusted to select him. "Perhaps it would be better" to have the elections occur annually as at present and give us a chance to get rid of an undesirable officer with neatness and dispatch. Just at this moment, when the people everywhere are demanding the recall, with a

view of shortening the terms of all but efficient officials, the proposal to extend the terms in the Fern Society is astonishing. Are the officers of the Society aware that the president of the American Association for the Advancement of Science serves but one year? Then why should those who only think they are advancing science serve longer?

BOOK NEWS.

The question of the evolution of plants has always been one of particular interest to the fern student, since fossil ferns and fern-like plants are so intimately associated with it, and this interest deepens with every new discovery. A generation ago, what was written upon the ancestry of modern plants was largely theory or guess work; now, thanks to more abundant material and improved methods of study the student of fossil plants speaks with more certainty. Recently many species have been found so well preserved that thin sections under the microscope reveal the cell structure, and all the details of spores, prothallia, sex organs, vascular bundles and the like. It is even possible now to state positively whether many of the species that ceased to live millions of years ago, were isosporous like *Lycopodium* and the ferns generally or whether they were heterosporous like *Selaginella*. All this information has made possible a recent book on "The Evolution of Plants" by D. H. Scott, one of the most eminent of present day students. In this, the author takes up the fossil record, of the plants states the problem of their origin, considers the evidence, traces the origin of the prominent groups in the light of the evidence, and finally renders a verdict that seems quite in agreement with the facts. The present view is, in brief, that the angiosperms have arisen

from an ancient branch of the cycads, the point at which they appeared being somewhere near the magnolia family. The structure which specially characterizes the angiosperms is of course the seed, but we are not to assume that the modern flowering plants are the only ones to bear such structures. Many of the species once called ferns are now known to have had the seed habit and they are no longer classed with the fossil ferns but form a new group the Pteridosperms. These are regarded as having originated from the ferns, however, but are not considered the ancestors of present plants. The *Lycopodiums* are regarded as having existed from remote time almost unchanged except as regards size and stem structure, and to have given rise to no other modern groups. The *Sclaginellas* have been found to run back as far or farther than the *Lycopodiums*, and always, as at present, with two sizes of spores. Nor does the author regard the origin of the conifers from such groups as at all probable. He is inclined to assign them a place as the descendents of certain ancient plants called *Cordaites*. An interesting point in the whole problem is the fact that many of the earliest ferns, club-mosses and scouring rushes, were much more complex in structure than their modern descendents. The author has succeeded very well in his aim to make a book for the general public. It is free from technicalities, well illustrated, and very attractively written. It is published by Henry Holt & Co., New York at 75 cents.

"Ancient Plants" by M. C. Stopes, is another book that will interest the student of fossil plants. This is designed to give a full and popular account of the vegetation that flourished on the earth in past ages without special attempt being made to trace the origin of their modern descendants. A great deal of the work

treats of the structure of the ancient forms, which is made clear by numerous photographs of the specimens themselves. These are likely to be full of surprises for the student of modern plants who imagines that evolution has steadily added to the complexity of plants. In the structure of the stems, and in the details of the fruiting parts, many of these ancient plants were much more complex than any that exist today. The plants of the ancient world are included in ten great groups, among which are the true ferns, the seed ferns or pteridosperms, the cycads, the lycopods and the horsetails. A chapter is devoted to the past history each group in which the differences and relationships are treated at length. The book is therefore one of the best for becoming familiar with the fern flora that once flourished almost to the exclusion of other forms. It is published by the D. Van Nostrand Company, New York, at \$2.00 net.

ALL THE AMERICAN FERN BOOKS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
Our Native Ferns, Underwood, 6th Ed.....	1.08
Ferns, Waters.....	2.30
Our Ferns in Their Haunts, Clute.....	2.15
How to Know the Ferns, Parsons.....	1.60
Fern Allies of North America, Clute.....	2.15
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Who's Who Among the Ferns, Beecroft.....	1.05
How Ferns Grow, Slosson.....	2.25
Ferns and How to Grow Them, Woolson.....	1.17
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Vol. XIX

No. 3

The Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1911



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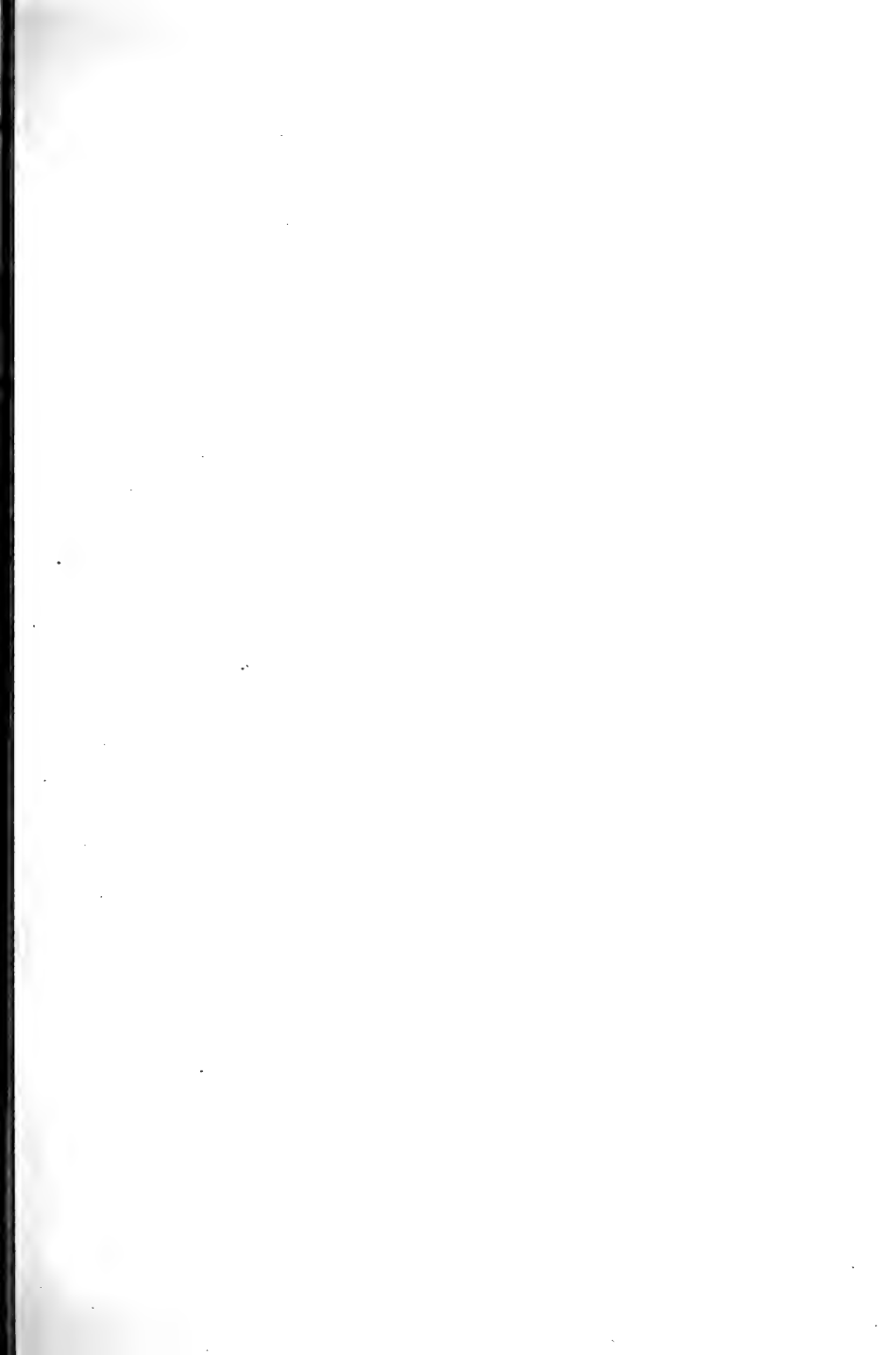
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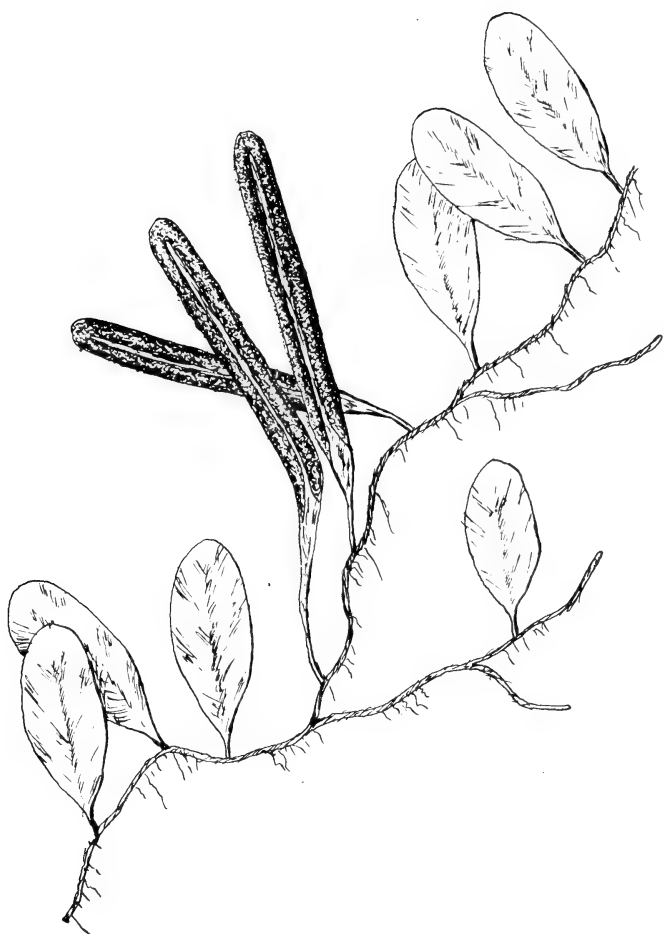
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DRYMOGLOSSUM CARNOSUM.

THE FERN BULLETIN

Vol. XIX

JULY, 1911

No. 3

DRYMOGLOSSUM CARNOSUM.

BY WILLARD N. CLUTE.

One of the drawbacks to popular fern study in the Tropics is the fact that very few of the species have common names. Thus it happens that the little fern which is the subject of this article is known by a name almost as long as itself. The fact that it has no common name also indicates that it is known chiefly to scientists who seldom look with favor on names in the vernacular. It is, however, not uncommon in suitable situations across a considerable stretch of country but its small size and lack of usefulness conspire to render it insignificant in a region where other ferns abound.

Drymoglossum carnosum belongs to a small genus of plants that until recently was considered to be confined to the warmer parts of the Old World. Two species, however, have now been reported from the American Tropics, and if the species makers do not soon re-arrange them in some other group we will find it necessary to consider the genus as circumtropical. The danger that the American species may be removed to other genera is possibly not very remote, for even the species here discussed has had a somewhat checkered career appearing in various works as an *Acrostichum*, a *Taenitis*, a *Pteris*, and in several other disguises. It belongs to that peculiar group of ferns in which the sporangia spring from the veins without the protection of an indusium and out of which have been

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carved such genera as *Vittaria*, *Antrophyum*, *Tacnitis*, and others, in fact Hooker has suggested that it would be well to make two genera by combining *Vittaria*, *Tacnitis* and *Drymoglossum* placing in one the species with sori close to the margin and the other those with sori remote from it. The principal reason given for separating *Drymoglossum* from *Tacnitis* is that in the former group the fronds are dimorphic.

Including the two American species, there are now but nine species in the genus *Drymoglossum*. The seven Old World species are found in India, China, Japan and in the adjacent islands. The species, *carnosum*, which we illustrate, is found in China and Northern India, and extends to the Philippines where the plant from which the illustration was made, was collected by D. Le Roy Topping.

Drymoglossum carnosum is an attractive little plant with a very slender and wide creeping rootstock which gives off the small, entire, oblong sterile fronds at intervals of an inch or more. The fertile fronds are very different from the sterile, being two or three times as long and very narrow. The sterile fronds are barely stalked but the fertile have decided petioles. The sporangia are borne in a dense continuous line midway between the margin and the midrib and when young are covered with peltate scales. Both sorts of fronds are quite thick and leathery as befits a species exposed to tropical drouth. It is interesting to note that the fertile and sterile fronds are not produced indiscriminately, but that each set is produced at a definite time in the life cycle. Even in species of ferns, in which we commonly discern no structural difference between fertile and sterile fronds, there is usually to be distinguished a seasonal difference, the fertile

and sterile groups alternating. In most dimorphic species, this seasonal difference is more strongly marked because of the difference that also exists in the form of the two kinds of fronds.

NOTES ON AMERICAN FERNS: VIII.*

BY WILLIAM R. MAXON.

ANOTHER ALABAMA STATION FOR *TRICHOMANES PETERSII*.—At page 84 of volume VIII of the *Fern Bulletin* I published in 1900 a brief account of the known localities for *Trichomanes Pctersii* in Alabama, particularly of those in Winston and Etowah Counties, and made mention of its reported occurrence in the "rock houses" at Pikeville, Marion County. Specimens collected during the summer of 1909 by Prof. H. H. Smith are now at hand from an additional locality in Marion County. These are from the gorge of the Bullahatchee River, 2 miles east of Hamilton, and occur closely imbricated into a dense mat which is said by the collector to have covered a large rock in talus at the foot of a cliff. They are perfectly characteristic of the species, and among them are many fertile fronds. Professor Smith writes that in his search for land shells he made no particular effort to secure ferns and may easily have overlooked the species in other localities. He adds: "The places to look for it would be the deep 'coves' of the Cumberland plateau of northern Alabama; also the coves of Sand Mountain." There is, of course, every reason to suppose that it is not uncommon in that general region, as was suggested in 1900. Since that time it has been collected near Saratoga, Mississippi, by Prof. S. M. Tracy, and near Tallulah Falls, Georgia, by Mr. A. B. Seymour. (See

* Published by permission of the Secretary of the Smithsonian Institution.

Torreyia, 3: 18-19, 1903.) The habit of the plant, which has been often described, renders it inconspicuous and unpromising to the average collector of flowering plants. Unless especial search is being made, it is much more likely to be gathered by collectors of mosses and hepatics.

PTERIS LONGIFOLIA AT NEW ORLEANS.—This species was apparently first recorded from Louisiana by Mr. Clute in 1902 (*Fern Bulletin*, 10: 33), upon specimens collected by him from masonry in the "Girod street Cemetery" and the "old St. Louis Cemetery" in New Orleans. In the following year Clute and Cocks reported it (*Fern Bulletin* 11:4) as "abundant on the walls of most of the Cemeteries of New Orleans, and apparently well established." The original source of the specimens now growing in New Orleans can scarcely be determined with certainty, but that the species occurred there as long ago as 1889 is attested by plants recently received at the National Herbarium marked as having been collected at the St. Louis Cemetery, New Orleans, in December, 1889.

ANOTHER NEW JERSEY STATION FOR ASPLENIUM EBENOIDES.—In a collection of ferns recently received at the National Herbarium are two small fronds of *Asplenium ebenoides* Scott from the vicinity of Blairstown, New Jersey, collected August 2, 1883, the collector's name not given. They are similar to the form found near Baltimore, Maryland, by Dr. C. E. Waters and figured by him (*Fern Bulletin* 10:3, 1902), except that they are essentially pinnate at the base, the pinnae broadly triangular-cordate and sessile, or even minutely stalked. Both fronds show an occasional junction of the ultimate veinlets near the margin, also in this resembling Dr. Water's plants. They were received under the name *Asplenium pinnatifidum* Nutt.

AZOLLA CAROLINIANA IN ALASKA.—So far as the writer knows, *Azolla Caroliniana* has never been reported from Alaska. The present record relates to plants in the U. S. National Herbarium, unaccompanied by an original label, and marked simply "Alaska, Bischoff, 1868."

AN ADDITIONAL ASIATIC FERN IN THE UNITED STATES.—In the several articles in the last number of the *Bulletin*, relating to the probable identity of *Asplenium Ferrissi* of Arizona with the Old World *Asplenium alternans* (*Ceterach Dalhousiac*) mention might have been made of the similar case of *Asplenium exiguum*. This is a species, described from India by Beddome in 1863, which according to Christensen ranges from southern India to Central China. Several students have been of the opinion that it is doubtfully distinct from *Asplenium Glennici* Baker, described from Mexico in 1874 and ranging to Conservatory Canyon, in the Huachuca Mountains, Arizona, where it was collected by Lemmon in 1882. The case is stated at some length by the late C. W. Hope, writing in the *Bulletin of the Torrey Botanical Club* for February, 1899, (26:58-62). Hope, whose paper will be found very interesting, had no doubt that the Asiatic and American plants were of the same species, a conclusion which seems to be substantiated by an examination of the material in the National Herbarium. A number of similar instances might be cited of tropical ferns which are common to both hemispheres,—species which even in these days of extreme segregation few writers would dare attempt to divide on grounds of geographic distribution. As to *A. Ferrissi*, its relationship to *A. alternans* was apparent to the writer upon the publication of the figure with the

original description. Two detached fronds received later were, however, of very different form, not at all characteristic of *A. alternans*, and the question of the distinctness of the American form was left in abeyance. The case has certainly been presented with sufficient completeness recently, leaving little doubt as to the proper reference of the Arizona plant.

THE HART'S-TONGUE IN TENNESSEE.

BY E. W. GRAVES.

Having made two trips to the South Pittsburg station of the hart's-tongue, I thought perhaps you might be interested in hearing how the fern was holding its own in that locality. The first trip I made on the sixth of May. At that time the fern had not made sufficient growth for me to tell just how many there were, so I made a second trip September 28. This was before any frost had touched the plants and they were at their best. They were not large plants—only five or six had fronds a foot long. The remainder were small. Some were just emerging from the gametophyte stage.

The numbers have greatly decreased since Mr. and Mrs. Joseph H. Lodge visited the sink in 1898, as they reported about two hundred at that time. By actual count I found there was only fifty-eight plants. I do not know what has been the cause of the decrease; it may be that the sides caving in has destroyed a good many.

There is another danger that now threatens the fern at this place and may ultimately cause its total extinction. About three years ago a million dollar cement plant was located at the foot of the mountain on which the fern grows, a young town has sprung up and the

limestone is being blasted out for commercial purposes. The ferns may not be molested for some time to come as the cement plant is cutting into the mountain on the right of the ravine while the haunt of the fern is far up near where the sandstone sets in on the left of the ravine. We can only hope that this haunt of an already rare fern may in some way escape being disturbed.

Long Island, Ala.

THE EFFECT OF HABITAT ON OPHIOGLOSSUM.

BY WILLARD N. CLUTE.

Whenever I am asked to examine a collection of the various species of *Ophioglossum* there comes to mind the observations of Hooker in regard to our common species. After many years of study, in which he had an opportunity to see *Ophioglossums* from all parts of the world, he gave it as his opinion that *Ophioglossum vulgatum* is widely distributed, and that the differences presented by specimens from widely separated regions, are only such as might be expected in view of the great diversity of habitat in which the plants grow. With this opinion, we have long been in accord and this impression is only deepened by the examination of additional material.

A few years ago, it was suggested that several forms of this plant in North America should be raised to specific rank, and one or more were thus recorded as specifically distinct from *O. vulgatum* but such work could only have been commended by those bent on finding differences rather than resemblances. The distinctions have never been accepted by the majority of American students.

The whole subject is brought forcibly to mind by the receipt of several sheets of *Ophioglossum vul-*

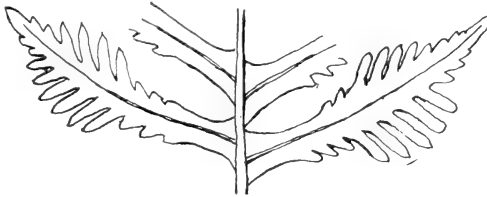
gatum collected by Mr. W. A. Poyser at Middletown, Pa. The species here grows in quantity on a hillside sloping down to a boggy meadow, and the specimens show a regular gradation from the hill-top downward. In the short grass in drier ground, specimens in full fruit, and only five inches high were collected. In the swamp close by, however, there were specimens more than sixteen inches long. But the mere height was not the most interesting feature of the plants. The sterile lamina in some cases had taken on new forms, and had these, alone, been sent to some of our ambitious species makers they would undoubtedly have received a new specific name. Happening with the usual form, they are readily seen to be the usual species modified by environment. In some of the specimens collected the sterile lamina is eight inches long and less than three quarters of an inch wide, and may well be called variety *lanccolatum*. These latter specimens were taken from the boggy ground at the base of the slope where they occurred amidst the rank growth of vegetation that is found in such places. The elongated sterile portion was undoubtedly caused by the efforts of the plant to stretch up to the light, but this simply emphasizes the statement made at the beginning of this article, that the species is strongly affected by its habitat.

RARE FORMS OF FERNWORTS.—XIX

BLECHNUM SPICANT BIPINNATUM.

In superficial characteristics the deer fern (*Blechnum spicant*) is very much like the ebony fern (*Asplenium ebeneum*), and seems inclined to vary in much the same way. In Europe where the deer fern is not rare, a great number of crested, forked and laciniated forms have been discovered, but so far as

known the fern has produced but one marked variety on this side of the Atlantic—or possibly it would be well to say Pacific since it comes from Vancouver Island off the coast of British Columbia. This single form, however, according to Mr. C. T. Druery who recorded its finding, has quite surpassed similar finds from the Old World. In the illustration herewith, which shows a pair of pinnae about natural size from near the middle of the frond it will be noticed that the serrations which form its distinctive feature are not uniform throughout the pinnae but are bunched together at a short distance back of the tip, a striking departure from the slender scythe-shaped pinnae of typical



Pinnae of *Blechnum spicant bipinnatum*.

plants. Although recorded as one of numerous bipinnate forms that have appeared from time to time, it may be questioned whether this should be closed with the ordinary forms to which the name *bipinnatum* is given. The peculiar broadened outer half of the pinnae ought to entitle it to another name perhaps *pectinatum*. There are, however, too many finds of this type known in Europe to make it safe for one on this side of the world to venture a new name. Perhaps when this falls under Mr. Druery's eye he may be kind enough to enlighten us as to its right to a separate name. Among the many excellent illustrations of the forms of this fern in Mr. Druery's recent "British Ferns and their Varieties," we find no forms that very closely ap-

proach this one, nor is *bipinnatum* listed among the other forms. The specimens illustrated were found by Geo. Fraser of Uclulet, B. C., who it is understood moved them to his garden where they reverted to the type the following year. Spores sent to England are reported to have reproduced the new form as well as several others. It is likely that the original plants would once more produce the form when given good cultivation.

An interesting point of nomenclature is connected with the generic name of this species. In the older American fern books it is pretty generally given as *Lomaria spicant* but most modern works list it under *Blechnum*. The whole matter turns upon the arrangement of the indusium. The genus *Lomaria* is characterized by an indusium formed by the recurved and altered margin of the pinnules and the sori are therefore marginal and form a nearly continuous line. In *Blechnum* on the contrary, the indusium, is distinct and though the sori are also marginal in some species, the arrangement is quite different from that of *Lomaria*. Our species has such narrow fertile fronds crowded with sori that for a long time the fact of a special indusium was not noticed, or if noticed was not given sufficient weight.

FERN SEED.

"We have the receipt of fern - seed; we walk invisible," says one of Prince Hal's rollicking companions in Shakespeare's play of "Henry IV." and Ben Jonson makes one of his characters say, "I had no medicine, sir, to go invisible, no fern-seed in my pocket." As late as Addison's "Tatler" we are told of a quack advertising that he "had

discovered the female fern-seed." This is all very puzzling to an age which has lost, almost entirely, the amazing traditions and superstitions which were current in the Middle Ages concerning every plant, stone, and animal. These traditions were dressed up, perverted, and confused survivals of the still earlier beliefs of innocent country-folk throughout primitive and prehistoric Europe and the East, some of them based on real experience and fact, others purely fanciful, or the outcome of a primitive system of magic and witchcraft.

The puzzling thing to the modern man about the fern-seed tradition, namely, that the seed of the fern is invisible, and confers invisibly upon whomsoever may gain possession of some of it, and carry it in his pocket, is that so far is fern-seed from being invisible that every schoolboy and schoolgirl knows the spore-cases of the fern, the little brown circular or oblong patches which appear on the back of the fern-leaf or frond when mature. These certainly have the appearance of being "seeds," that is to say, reproductive particles to be shed by the fern, which, as a matter of fact, they are (though not seeds in the strictly botanical sense), and it is astonishing that they were not recognised by our forefathers.

It is difficult at the present day to come across anyone who knows or has heard of "fern-seed" and its marvellous properties. Yet it was a belief of the ancient inhabitants of Britain and of the French Bretagne, which they colonised, that anyone who could obtain possession of some "fern-seed" would become invisible and receive knowledge of all secrets. The belief was widely spread in this country throughout mediaeval times, and persisted till the end of the eighteenth century. As late as 1793 a respectable

countryman at Heston, Middlesex, informed an inquirer that when he was a young man he had frequently taken part in catching the "fern-seed" at midnight on the eve of St. John the Baptist. The attempt to catch it was, he said, often unsuccessful, for a plate had to be placed beneath the fern, and the seed must fall into it "of its own accord," without any shaking of the plant. Another searcher of fern-seed reports that the seed must be looked for on Midsummer's Eve, and that the searcher must go barefoot, and with no other clothing than a shift. He stated that when he went to gather it the "spirits" (presumably moths or other nocturnal insects) whisked by his ears, and sometimes struck his hat and various parts of his body. At length, when he thought he had gathered a good quantity of it and secured it in paper and a box, he went home. But on examining the paper and the box he found both empty! He does not say how he expected to detect its presence, being a thing invisible! That appears to have been a distinctive and curious feature about capturing fern-seed.

The ancients (Greeks and Romans) held that there was no such thing, that ferns did not produce any seed. As to how they propagated no decisive opinion existed. The mediaeval folk improved upon this. They said, "Ferns must reproduce by seed as other plants do, and since the ancients say that ferns have no seed, that must be due to the fact that the seed is there, but is invisible!" Accordingly, they firmly held that ferns produce invisible seed, and then added to this conception, in accordance with the doctrine of signatures, the assertion that he who gained possession of some of this invisible seed would himself become invisible. The delightful absurdity of hunting on Midsummer's night for invisible seed, as to your success in finding which

you could never come to any conclusion except by yourself becoming invisible, seems to have taken firm hold on those who loved nocturnal rambles on summer nights in company, and to have suited the mystifications and chicanery of the wizards and magicians of the day. The pursuit of fern-seed suggests Lord Bowen's evocation of "a blind man in a dark room seeking for a black cat—which is not there," to which combination he compared the study of metaphysics.

The most delightful piece of absurdity in the whole affair is, as I have already pointed out, that ferns of all kinds do produce a sort of seed—the brown or yellow circular or oblong up-growths on the under surface of their leaves, which are little cases filled with "spores." They do not ripen till full summer or autumn, and on St. John's Eve, when the fern-seed hunter went forth, they are truly enough invisible, and practically non-existent.—*From an article by Sir Ray Lankester.*

HOW I FOUND SCHIZAEA PUSILLA.

We were paddling around the shores of Grand Lake, Nova Scotia, in a birch-bark canoe searching for a nice beach, intending to take a bath. It was the middle of July, 1879 and we had gone all around the island where the loons nested, whose quavering call at night added so much charm to that wild and lonely lake, but nowhere had we found a smooth stretch of beach. Finally we crossed over to the shore where the bits of bark from the tannery had floated down in the stream and formed a delta on the shore where it emptied into the lake. Here were brilliant masses of the fragrant *Utricularia cornuta* and among the stones near by grew that rare little European plant, *Littorella lacus-*

tris which at that time was known to occur only in one other station in North America. We landed a short distance beyond, attracted by the fragrance of a bed of the beautiful pink orchid, *Pogonia ophioglossoides*. Here the shore sloped away in a smooth sandy beach, but the bank formed a turfy seat about a foot higher than the beach, matted and held together by the stout black rhizomes of the royal fern and sweet gale. I knelt down to dig up a good plant of the orchid so as to get the roots, and there, growing under the edge of the miniature bank I found *Schizaea pusilla*. The plants were very small and the fertile spike still immature but I recognized it though I had not seen it growing before because I had specimens of it from the pine barrens of New Jersey. I left it growing for a month longer and then collected a few specimens, nearly all there were, none of them more than two inches in height. One of these was sent to Prof. Eaton at Yale, one to Dr. Gray at Harvard and one in the herbarium of Columbia College and two others are in private collections. Dr. Gray was delighted to receive his and wrote to me that he had seen long ago the specimens collected by DePylaie in Newfoundland in the Herbarium of the Jardin des Plantes in Paris but that everyone had supposed until I had discovered it again in Nova Scotia that the locality cited was incorrect and that the specimens must have come from New Jersey. He sent me in return a small package of rare ferns, among them the smallest and rarest one found in the United States, *Trichomanes Petersii* which grows on wet rocks in Alabama, the only representative we have of a small group of the large tropical family of the filmy ferns. Prof. MacKay of Nova Scotia has since searched the locality where I found it but in vain. He

said that the shores of the lake had been swept by forest fires and it had been probably exterminated in that way. It is one of the few remaining survivors of a time when a tropical flora was distributed as far north as Greenland and the *Schizacae* are now represented by only a few tropical species all odd and very highly differentiated. It is not difficult, however, for even an expert botanist to overlook it and one of the members of the Torrey Botanical Club is known to have gone to the pine barrens of New Jersey to search for it in a locality where he had found it before and to have come home, as he supposed without it and found it among some sundews which he had brought in a box for his classes.

At the time the American Association for the Advancement of Science met in Philadelphia in 1884, the members of the Academy of Natural Sciences, organized a botanical excursion to the barrens near Egg Harbor and took a carload of botanists there on purpose to find *Schizaea* and other local plants. Several members of the British Association, which held its sessions that year in Montreal, were with us, John Ball, Mr. Carruthers as well as Dr. Gray, Mr. Redfield, Mr. Canby, and Dr. Bernard Brinton and Mr. I. Marrtindale who acted as guides. We were shown a large patch of the rare and curious fern which is the subject of these notes and to many of the party previously known only from dried specimens. The guides told us that they had discovered it entirely by accident, while sitting near the railroad track eating their luncheon. We all gathered fine specimens some of them six inches high, as well as the plant usually found growing with it in New Jersey, *Lycopodium inundatum Bigelovii*. We

have since searched for it in vain at Tom's River, New Jersey where it is known to grow and we incline to the belief that it is owing to its wiry leaves and small size that it is known from so few localities.—Mrs. E. G. Britton in *Linnaean Fern Bulletin*, Vol. IV. p. 17.

THE FRAGRANT SHIELD FERN.

I had another gala day this season, when with the help of a friend I found the last of our New England ferns—*Dryopteris fragrans*. I have spent a good many hours among our cliffs during these ten years past hunting for this little fellow and had given up expecting to find it. Several times I had thought it found but it would prove to be only the *Woodsia Ilvensis*. There could be no possible question this time as to its identity. It was way up on the bare dry face of a cliff, far out of reach except by some sort of a ladder. But it was so unlike any other species, with its dry, curling snuff-colored fronds of last year that I knew it was the one I wanted. We found more of it later that was accessible. I think that the professors who have written our descriptions of it have never found it for themselves. Its chief characteristics are: 1st, that peculiar appearance of the old fronds; you could not curl them more gracefully than they appear drooping over the ledge of rocks. 2nd, the glutinous fronds; they cannot be taken from the paper until they are dry and grass and leaves adhere to them. 3rd, its peculiar fragrance. Gray says "aromatic;" that doesn't half tell the story. I gathered a clump of it on the cliffs and dropped it down in my handkerchief and the perfume lasted for days. I think it is like new mown hay composed largely of sweet briar rose leaves. It grows on the driest cliff sides, where everything else would be scorched

by the sun's heat; not "especially near waterfalls" as Gray's Manual says. Look for a place where there is a bare cliff, overhanging a little, perhaps, so that the rain cannot reach it and up above all the trees so that it can have no shade at all and if you find a fern there test it by its perfume, its stickiness and its beautiful brown curls.—James A. Bates, in *Linnaean Fern Bulletin*, Vol. IV., p. 3.

THE RELATION BETWEEN THE STERILE AND FERTILE LEAVES OF DIMORPHIC FERNS.

The dimorphism existing between the leaves of certain ferns which have expanded sterile leaves and smaller ones devoted entirely to the production of spores, presents in some species very interesting problems which have hitherto received but little attention. This note to the *Linnaean Fern Bulletin* is suggested by the note on *Osmunda cinnamomea frondosa* in the January number by Mr. C. D. McLouth. That note is a very interesting one to me, since I have been engaged for two years with experiments on two other dimorphic ferns belonging to the genus *Onoclea* viz., *O. sensibilis* and *O. Struthiopteris*, both of which grow in abundance near Ithaca. Readers of the *Bulletin* will recollect a form of the sensitive fern which was named by Dr. Torrey, *O. sensibilis obtusilobata*, and which was even described by Schkuhr as *O. obtusilobata*. As will be seen by comparing recent editions of Gray's botany this has recently been considered by some as simply an abnormal form.

At the Rochester meeting of the A. A. A. S. Prof. Underwood presented a note on the form of this fern and suggested that the intermediate fruiting leaf was the result of some injury to the sterile leaf. This was

opposed by several botanists. When I published my little book on the biology of ferns I called attention to this peculiar form and accepted Prof. Underwood's suggestion as the one which is in accordance with what some of us believe to be a law of nature. When this book was reviewed in *Nature*, this theory was severely criticised and this criticism was the immediate cause of my undertaking the experiments to determine the cause of this abnormal form for I firmly believed that these forms could be readily produced by artificial treatment in the case of this species. I accordingly took my knife, and going to the spot where the ferns grew in great abundance, cut off the leaves (about the 10th of May 1894) which were then about one foot high. In the course of another month, the new sterile leaves which had grown up were cut down and again in two weeks so that the third crop of sterile leaves was cut off before there was any sign of the fertile leaves appearing, either in the experimental plot or where the leaves had not been disturbed. The latter part of June and early in July the plants which had been operated on had developed a large number of the abnormal forms of the fruiting leaf while in the adjacent plots, where the leaves had not been disturbed, none of the abnormal forms were present. Twenty-five or thirty of the plants which showed a series of every gradation from perfect fruiting leaves to completely sterile leaves were taken to my laboratory and photographed and all of these were preserved natural size so that any "doubting Thomas" who should come along could see the specimens as convincing argument of the effectiveness of the experiment. In all these gradations the terminal portions of the leaves, pinnae and pinnules, were more expanded than the proximal

portions and the sporangia also showed every gradation of development or rather every stage of degradation and sterilization. In some cases these gradations were shown in all stages on a single leaf and in others the only sign that the leaf had once intended to be fertile was the presence of rudiments of the indusia on fully expanded and broad leaves.

In the summer of 1895 similar experiments were performed on the other species *O. Struthiopteris* and similar results were obtained. This is the more interesting since to my knowledge no abnormal form of the fruiting leaf in this species had been reported, though it would not be surprising if we should hear of some who have found them. These abnormal leaves look very curious indeed in the ostrich fern and they do not reach near the size of the sterile leaves while they often do in the case of the sensitive fern.

While these facts are extremely interesting to all who love ferns there are certain problems connected with the more fundamental relation between the fertile and sterile leaves which are of absorbing interest to me, just now, and of which I cannot here speak because it would make this article too long. But I assure any reader of this note that I should be only too glad to receive specimens of any ferns in which these transformations have taken place and if any one should come across similar transformations of the pistils of flowers to partial leaves, the plant would be very welcome to me. Mr. McLouth has I think rightly interpreted the influence of the fire on the *Osmunda cinnamomca* but from some preliminary experiments which I started on this same fern last year, I should think the fire ran over the ground the season prior to the appearance of the abnormal leaves instead of the same season; but until I

have opportunities for further experiment I shall not offer an opinion. *Geo. F. Atkinson, in Linnæan Fern Bulletin, vol 4, p. 34.*

PTERIDOGRAPHIA.

PELLAEA GRACILIS ON SANDSTONE.—The slender cliff brake (*Pellaea gracilis* or *Cryptogramme Stelleri*) is one of the ferns reputed to be strictly confined to ledges of limestone rocks and its finding in any other situation is always unusual, in fact, until recently the only record of its occurrence on rocks of different character was that for the vicinity of Waukon, Iowa, where it has been reported growing on both the St. Peter's sandstone and the Trenton shales. To this record must now be added that of Mrs. Charles Beach, who recently gathered specimens from a ledge of sandstone in the Catskills of Southeastern New York at an altitude of about 2000 feet. This is apparently the second report of the fern on pure sandstone and the first report of the kind for the Eastern States. The editor of this journal, however, found the fern on shales containing some lime, in southern New York.

TRINOMIAL FERN NAMES.—For several centuries, at least, we have been getting away from the use of trimonials in the names of plants, except as they are used to designate that sub-division known as the form, variety or sub-species, but there still lingers in our nomenclature of the ferns a considerable number of names having three instead of two words in their make-up and therefore not properly included in a nomenclature asserted to be binomial. Among some of those that readily come to mind may be mentioned

Athyrium filix-foemina, *Nephrodium filix-mas*, *Asplenium ruta-muraria*, *Asplenium adiantum-nigrum*, *Adiantum capillus-veneris*, and *Asplenium trichomanes-dentatum*. To be sure we have hyphenated two of these terms and pretend that this makes them one, but we have no authority for so doing. Another instance tending to show the way in which the name-tinkers have played fast and loose with the names of plants is found in that abomination *Filix fragilis*. This is not the name of the plant as given by Linnaeus. He called it *Polypodium filix fragilis*. When the modern nomenclaturist attempted to foist *Filix* upon us are the name of the genus he should have given us *Filix filix fragilis* but even the most hardened name-tinkers balked at this and we have *Filix fragilis* instead. Nevertheless we recently had presented to us the spectacle of the substitution of the three-word *Asplenium trichomanes-dentatum* for *Asplenium dentatum*.

SPORTING OF POLYPODY.—Accompanying an attractive set of finely cut specimens of the common polypody comes an interesting note from Mr. Amedee Hans of Locust Valley, N. Y., detailing how they were produced. Mr. Hans has been experimenting with the cut-leaved and other abnormal fronds for some time. Two years ago, he sowed the spores of the form known as *Polypodium vulgare* f. *bifido-cristatum* and as the young plants did not appear to differ much from normal specimens about a hundred of them were planted out in a piece of woods. As they grew older, however, they began to take on more variation until now many of them are giving fronds that are essentially another form named *P. V. cornubiense* f. *elegantissimum*. Only a single plant, so far, has re-

verted to the *bifido-cristatum* form though curiously enough, nearly every specimen bears two sorts of fronds, one more finely cut than the other. The question that is now puzzling Mr. Hans is, can the form *bifido-cristatum* change to *elegantissimum*. This change involves a change from the forked to the plumose form. Since the spores of *bifido-cristatum* were sown by themselves, there does not appear to be any possibility of accounting for the change upon the ground that two forms have crossed. It appears, indeed, to be due to genuine sporting, though the forms obtained are apparently indetical with specimens regarded as crosses on the other side of the Atlantic. To make sure that his conclusions are properly drawn, Mr. Hans has started the whole experiment over again, great care being taken to exclude foreign spores in the sowing. The young plants are just appearing and we may expect their behaviour to throw light on the puzzle. While it is quite likely that some ferns may cross, it is the opinion of Mr. Hans, that most varieties arise, not through crossing but by sports. This opinion seems to have received additional confirmation from the experiments thus far made.

FERTILIZATION IN FERNS.—It was not until the nineteenth century, actually within living memory, that the real history of the reproduction of ferns was discovered. It was not possible to ascertain the facts until the microscope had been improved, and the methods of study of the structure of plants and animals had made vast progress and yielded a mass of new knowledge. It was discovered in 1844 (Nageli and Suminiki) that upon the under surface of the flat green prothallus which develops from the fern spore, two kinds of minute warts take origin. The one are

little volcano-like protuberances, each containing a single ovule or egg cell, and may be called egg-pits; the other kind are tiny sacs which contain liquid full of actively moving spiral filaments (beset with vibrating hairs or cells), resembling in essential character the spermatozoa or motile sperm filaments of animals; they are the sperm-sacs! The excessively minute microscopic motile "sperms" escape by the bursting of the sacs, and swim through the film of water on the surface of the "prothallus." When one of these microscopic sperm-screws thus arrives at one of the volcano-like egg-pits, it plunges into its opening and fuses with the contained egg cell, thus fertilising it. It is then, and not until then, that the egg cell commences to grow and divide, and gives rise to the young fern plant. The fern plant nourishes itself and develops rapidly, whilst the little green prothallus, having borne its crop of eggs and sperms, withers, and is seen no more. The fern plant on attaining full size and maturity produces, as did its grandparents, spore cases on the back of its leaves, which in due time shed their minute unicellular spores, and these falling on the moist earth grow, without any "fertilization" by pollen or sperm, into marchantia-like prothalli. Thus there are two distinct generations in the life history of the fern. The first is the large foliaceous plant with stem and foliage, which we call a fern. It produces spores of only one kind; they are self-sufficient, and germinate without any fusion with, or fertilisation by, sperm or pollen. This generation—the fern plant—we call "the spore-bearer," or sexless generation. The second generation is the little flat prothallus which arises from the spores of the spore-bearer. It—and this is the remarkable thing which so long escaped the observation of botanists—produces male and female

reproductive organs—the sperm-sacs and the egg-pits. It, small and obscure though it be, is a complete organism in itself, producing “eggs” or “germ-cells” which are duly fertilised by sperm threads. We call it, in contrast to the first generation, “the egg-and-sperm bearer” or the sexual generation. Each of its fertilised eggs gives rise by growth and development to a spore-bearer or fern. Thus, then, there is an alternation of the two generations, the spore-bearing big fern and the egg-and-sperm bearing marchantia-like prothallus. After all, our ancestors were right in thinking that something very queer and unusual underlay the propagation of ferns! Not the least noteworthy fact in the matter is that, the male fertilising element of the sexual generation of the fern is not dry, dusty “pollen” as in flowering plants, but microscopic aquatic “spermatozoa” like those of animals.—*From an article by Sir Ray Lankester.*

DISTRIBUTION OF SCHIZAEA.—Once upon a time the claim of the little curly grass (*Schizaea pusilla*) to a place in the Newfoundland flora, rested upon a sheet of dilapidated specimens in the Jardin des Plantes at Paris. They were reputed to have been collected by De la Pylaie in Newfoundland, but there was always a suspicion that the specimens really had come from the New Jersey region and in some way had become incorrectly referred to Newfoundland, until Rev. A. C. Waghorne rediscovered the species at Bay of Islands. Now and then the species has been recorded from other stations in both Nova Scotia and Newfoundland but it remains for a party headed by M. L. Fernald of Harvard University, last summer, to discover that the fern is really common for a hundred miles or more in Newfoundland, growing even upon the elevated table lands. From a great number of observations on this

and similar species, Mr. Fernald concludes that *Schizaea*, along with several other plants common to New Jersey or even farther south, spread northward to Newfoundland over a land bridge that existed in recent geological time. In this case, we ought to expect records of *Schizaea* from Cape Cod and from Long Island, and these may possibly be forthcoming when all the out-of-the-way corners have been ransaked.

NEPHROLEPISISSIMUS.—Just by way of record we take a mournful pleasure in listing a few more sports of the Boston fern. To give these the names adopted by their proud, though botanically ignorant possessors, they are: *N. Goodii*, *N. Harrisii* and *N. Springfieldii*. This last one is a gem. Apparently all you need to do to latinize any sort of name is to add ii to it. If a new form should happen to originate in Cincinnati we shall look for *N. Cincinnatii* at once.

A CURIOUS PANAMA FERN.—W. R. Maxon has recently described in the miscellaneous collections of the Smithsonian Institution, a *Polypodium* from Panama in which the apex of the frond is capable of continuous growth like species of *Nephrolepis*. The pinules are many times forked, and the sori borne on club-shaped vein endings that project beyond the segments of the frond on which they are located. The fern is named *Polypodium podocarpum* and is not distantly related to *P. curvatum* and various other species of the tropics that make their habitat the trunks of trees in the rain forest.

NEPHROLEPIS MUSCOSA.—Really we have lost count of the many sports of *Nephrolepis exaltata* but we feel sure that *Nephrolepis muscosa* has thus far escaped mention. It is reported to be a sport from *N. exaltata*

f. superbissima but should probably be named *N. exaltata* f. *muscosa*. Still another form has been named *veridissima* in allusion to its dark green color. Incidentally the name itself more than alludes to the ignorance of the namer in regard to the Latin word for green. *Nephrodium Giatrasi* is another sport hitherto uncatalogued. The inordinate multiplication of forms in this one species must already make British form makers tremble for their laurels. What is a mere three hundred forms of *Scolopendrium* or five hundred of the lady fern, to what we can produce if we try. *Exaltata* is a fine specific name; just the thing to exalt this side of fern growing. All we need is time.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omission from or errors in this list.

BENEDICT, R. C. *Botrychium Jenmani* in Cuba. American Fern Journal, Jl., 1911.

BLANCHARD, W. H. *Lycopodium complanatum* near Hartland, Vermont. Rhodora, 1911.

CLEVELAND, G. F. *Ferns of the Isthmus of Panama*, illust. American Fern Journal, Jl., 1911.

CHRISTIANSEN, C. *The Typical American Species of Dryopteris*, sub-genus *Endryopteris*. American Fern Journal, Jl., 1911.

CLUTE, W. N. *Hemigramma latifolia*, illust. Fern Bulletin, Jl., 1911.

CLUTE, W. N. *Rare Forms of Fernworts—XVIII; The Forms of the Marginal Shield Fern*, illust. Fern Bulletin, Jl., 1911. The forms *bipinnatifidum*, *elegans* and *Trailae* illustrated and discussed.

CLUTE, W. N. *The Distribution of Asplenium alternans*. Fern Bulletin, Jl., 1911.—Distribution of several rare ferns discussed.

FERRISS, J. H. *The Finding of Asplenium alternans*. Fern Bulletin, Jl., 1911.

HOPKINS, L. S. *A list of the Ferns Found in the Vicinity of Ohio Pyle, Pa.* American Fern Journal, Jl., 1911.

HOPKINS, L. S. *A New Variety of the Cinnamon Fern*, illust. American Fern Journal, Jl., 1911.—*Osmunda cinnamomea auriculata* proposed for the form previously named *bipinnatifida*.

KIMBALL, L. F. *Ferns of San Diego County, Calif.* Fern Bulletin, Jl., 1911.

KNOWLTON, F. H. *The Study of Fossil Ferns*. American Fern Journal, Jl., 1911.

MOXLEY, G. L. *Southern California Fern Notes*. American Fern Journal, Jl., 1911.

POYSER, W. A. *The Identity of Asplenium Ferrissi with A. Alternans*. Fern Bulletin, Jl., 1911.—*Asplenium Ferrissi* shown to be the same as the Himalayan *A. alternans*.

PRESCOTT, A. *The Walking Fern*. Fern Bulletin, Jl., 1911.

PTERIDOGRAFIA.—Fern Bulletin, Jl., 1911.—*Abnormal Lycopodiums, Cambium in Ferns, Forked Liquorice Fern, Death of J. H. Hart, Fragrant Bracken, Sex in the Ostrich Fern.*

EDITORIAL.

In this issue we again reprint matter from the out-of-print volumes of the *Fern Bulletin*. It has always been a matter of regret to many of our subscribers that these early volumes are unobtainable. At one time it was proposed to re-issue these numbers, but the project did not appear feasible and was abandoned. Although there was much in the original volumes that is no longer valuable, there is also much that is still worth reading. It is this matter that we hope to reprint from time to time.

* * *

At the end of another year, when this magazine changes hands, we expect to make up all the volumes into sets and destroy the odd numbers that have accumulated. We therefore give notice, that until the end of the year we will gladly supply, free, any copies of this magazine that may be missing from the files of our subscribers if we can do so without breaking volumes. Now is the time to exchange torn or soiled copies for good ones. We may add, that we have no odd numbers of volumes 1 to 5 or of volume 9 and very few of some of the others. It is well, therefore, to apply at once. After the magazines are made up into sets, we shall not, of course, break a set to supply a single volume. Those who lack the early numbers should order at once else they may later fail to obtain them at all.

* * *

The president of the American Fern Society has appointed a committee to again revise the Constitution. This Constitution has served the Society for nearly a fifth of a century and appears now to most of the members to stand in no urgent need of revision. There is, however, a disposition manifested upon the part of a

few to seize and run the Association in the interests of a certain brand of nomenclature, and the revision of the constitution is doubtless intended to make this scheme more easily accomplished. One of the means to this end is the proposal recently made to lengthen the term of office. This is, in effect, an assumption that the members are not equal to the task of selecting officers annually. Besides, when the gang gets in, they argue, it would spoil everything to make it possible for them to be speedily turned out. The constitution at present places nominations in the hands of those who know the members best—the past presidents. There is very little chance for a rascal to get past them, or even to get the nomination for office. It is now proposed to fix things so that anybody, by laying enough wires, can secure both nomination and election. In the Fern Society only about one member in five votes, and it is shrewdly urged that with a new rule in force allowing independent nominations, the gang ought to be able to roll up enough votes to keep themselves in office. The clear thinking members of the Fern Society, however, ought to set themselves actively at work to block this game, though after all, they may well ask what the use is of bothering about the matter. The American Fern Society is dead. The members may not yet have discovered it, but it is dead just the same. It is dead because the issue that called it forth is dead. We may maintain an association and pay dues, and wrangle over officers and constitution, but never again will membership in it be of any use to fern students any more than it has been for the past three or four years. The Fern Society was a device to help beginning students in a time when other help was not available. Now there are books in abundance

that will serve the purpose better than any society while fern exchanges may be effected expeditiously without recourse to an association. The Fern Society has recently done nothing for its members because there was nothing it could do. It has ceased to promote the study of ferns and seeks to justify its existence by changes of many kinds: changes in constitution, in methods of doing business in publications, in nomenclature, and in treatment of its members. We repeat, The Fern Society is dead. It is dead but it don't know it.

* * *

If language is considered merely as a means of conveying ideas, it really doesn't matter whether the young fern is called a seedling, as is the custom among the British, or whether we call it a sporeling after the fashion on this side of the world, but if we wish to be exact there are no two ways out of the matter. Seedlings and sporelings are two very different things. The old idea that they are identical or even homologous dies hard, however. In a recent publication, a well known fern student writes, "I have always regarded the two kinds of organs under the fern prothallus as the 'homologues' or counterparts of pollen grains and ovaries in the flowering plants. They perform the same functions entirely, though in somewhat different fashions and I cannot but regard it as 'hairsplitting' to raise objections to the parallel, or, under such circumstances, to find fault with the use of the word 'seedlings' instead of 'sporelings' in connection with young ferns so raised." The same writer further says that ferns grown by apogamy are true sporelings. The point of the whole matter, however, is that a seed is a definite entity, consisting of a

shell or testa enclosing a *young plant*. A spore, on the other hand, consists of a thickened cell wall within which there is not a plant of any kind—only some protoplasm and a nucleus. The seed consists of millions of cells, each the equivalent in structure, though not in function of a spore. Seedlings, therefore, must continue to be produced from seeds and sporelings from spores—the growers and fern students may call them what they please; it will not change their nature.

BOOK NEWS.

In 1908, the last year for which we have this information more than four hundred and sixty articles on ferns and their allies were contributed to the periodical press by fern students in all parts of the world. Contributions in the German language appear to be most numerous, but the single writer with the greatest number of articles to his credit is an American. The second most prolific writer is an Englishman and the two next are Germans. As usual, the bulk of the articles refer to nomenclature, distribution and the like with morphological topics second. The report in which abstracts of these papers are given covers nearly one hundred pages and is issued annually by Dr. C. Brick.

Dr. Ruth Marshall of Rockford College, Rockford, Ill., has issued an interesting little booklet entitled "Ferns of the Dells of the Wisconsin River," which is sure to be of value to the many tourists who visit that picturesque part of the Wisconsin. This consists of about sixty pages, in which text and illustrations alternate, each species pictured being described in un-

technical language on the page facing it. Twenty-seven species are illustrated, mostly from photographs, the rarest of these being the fragrant shield fern. The booklet is apparently designed simply for the identification of the ferns likely to be encountered, since nothing of popular interest is added to the descriptions, but for the use indicated, it is likely to be eminently successful. The book may be had of the author for 25 cents.

A recent issue in Henry Holt & Company's American Nature Series, is a volume on "Plant Life and Evolution" by D. H. Campbell well known to fern students for his contributions on mosses and ferns. The book traces the rise of the higher plants from algae through the ferns following pretty closely the sequence generally accepted and deriving the ferns from some liverwort-ancestor related to *Anthoceros*. It will be remembered that a volume has lately appeared in which the theory is maintained that ferns and mosses are not closely related and the re-statement of Campbell's position will be very useful to those interested in following the development of this phase of botany. The book contains 350 pages and costs \$1.60 net.

ALL THE AMERICAN FERN BOOKS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
Our Native Ferns, Underwood, 8th Ed.....	1.08
Ferns, Waters.....	3.30
Our Ferns in Their Haunts, Clute.....	2.15
How to Know the Ferns, Parsons.....	1.60
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Fern Collector's Guide, Clute.....	.54
Who's Who Among the Ferns, Beecroft.....	1.05
How Ferns Grow, Slosson.....	3.25
Ferns and How to Grow Them, Woolson.....	1.17
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Index to Vols. 1-10. Fern Bulletin. Paper.....	.25
North American Pteridophytes, Gilbert. Paper.....	.25
Ferns of Iowa, Fitzpatrick. Paper.....	.20
Mosses and Ferns, Campbell, 1st Ed.....	4.00
Mosses and Ferns, Campbell, 2nd Ed.....	4.50

Any of the above, to which a price is attached will be sent postpaid upon receipt of price. Out of print books may occasionally be obtained second hand nearly as good as new. The Fern Bulletin may be clubbed with any book listed at a dollar or more for 50 cents additional. A year's subscription will be given free with every order amounting to \$5.00 or more.

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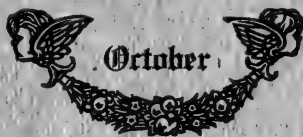
We have obtained another copy of Williamson's "Ferns of Kentucky" which we offer for \$4.50 postpaid. This volume, the first American fern book, compares very favorably with the most recent. It contains fifty-nine full page plates reproduced from etchings, and is the only fern book so illustrated. More than 150 pages of text give an account of the species. Valued highly for its unique position among fern books, and hard to get at any price, this copy will not remain on hand long. Order at once.

Vol. XXX

No. 4

The Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

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1911



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THE MALE FERN.—*Nephrodium Filix-Mas*.

THE FERN BULLETIN

Vol. XIX

OCTOBER, 1911

No. 4

THE MALE FERN.

Nephrodium filix-mas.

BY WILLARD N. CLUTE.

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The modern writers on ferns are prone to designate the plants by their scientific appellations and if any attention at all is given to the names in the vernacular, they are usually thrown in, in a half apologetic parenthesis, as a slight concession to those who have not yet attained proficiency in juggling words in a dead language. But it has not always been thus. In the good old days when men studied plants to discover their "virtues" and when the uses of a species bulked much larger in the collectors estimation than any dubious "honor" that might be derived from changing its name or perchance giving it an entirely new one, the common names of plants far transcended the scientific in importance. In that age, the species under discussion was known by the name of male fern, only. It was not until a more sophisticated generation had brought the name-tinker into existence that the eminent gentlemen who posed as philosophers began to designate their specimens by a string of Latin appellations—provided they were masters of sufficient learning to string the resounding terms together intelligently—but the common people simply used the time-honored common names and let it go at that. The nuisance of nomenclature is a fairly modern one and though not to be ascribed entirely to a few denizens of Eastern America, goes back not much farther than the immortal Linnaeus. These ancient worthies, deprived of Carnegie libraries and

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unable to subscribe for the modern magazines that would keep them up to the minute regarding the styles in botanical nomenclature, missed entirely the delights that come from wrangling over obscure and forgotten names, and were doubtless entire strangers to that system of nomenclatural "stability" in comparison with which an earthquake would look like a millpond on a summer day.

The science of botany began in the pleasant art of "simpling"—in the collecting and preparing of drugs that were reputed specific for a multitude of ailments, real or imaginary. Such plants as lacked useful properties, or a reputation for such properties, which is much the same thing in drugs, held no place in the public eye and entirely missed inclusion in those botanical "Who's Who's," yecept an "Herbal" by the untutored, that began to appear shortly after Johann Gutenberg discovered that there are other ways of making one's mark besides using a paint brush or a split goosequill.

The male fern, however, had no difficulty in holding a commanding position in these voluminous tomes. The plant seems to have been something of a wonder in those early days with a reputation for medicinal efficiency that made it stand out from the other ferns like a good deed in a naughty world. Indeed, so great was its fame that its remembrance still lingers in the *Materia Medica* of the present time. It was a favorite remedy with old Doctor Galen, and Doctors Theophrastus and Dioscorides, who were high rankers in the medical profession a hundred centuries before anybody who knew anything about medicine was born, held it in high repute for expelling the tape-worms that a thoughtless clientele would absent-mindedly develop as a result of endeavoring to assimilate meat that had not been properly inspected by the government experts.

But even in that day there were those who preferred to dope themselves with patent medicines instead of being doped in the orthodox way by methods that were not patent nor patented, and Louis XIV appears to have been among the number, for it is recorded that a certain Madam Norisser or Nuffler of Switzerland took advantage of his ignorance and also took the opportunity to relieve him of eighteen thousand francs, real money, in exchange for the information that the root of this plant is a vermifuge, and a very excellent tape-vermifuge at that. Whether this eighteen thousand francs story is a mere bit of pleasant fiction or the real facts, it is hard to decide. It is told also with reference to Louis XV and Louis XVI. The only thing that remains certain, is that the ferns reputation is founded on facts.

Though the ancients fully recognized the virtues of the male fern, they never quite comprehended its peculiar methods of multiplication. Long and earnestly they watched it for evidences of flowers and fruits and the more they watched the more mysterious, marvellous and miraculous the matter seemed. It was but a step, or rather a jump, to the conclusion that the seeds were invisible. This was quite correct—the seeds are invisible and always have been—but when the embryo pteridologers made the further inference that though invisible the seeds existed and only needed to be secured to make their possessor not only out of sight but bring him untold wealth as well, they opened the way for the practice of much chicanery by means of which the credulous hoped to achieve the Yankee apotheosis of success—the obtaining of something for nothing. That this something for nothing could only be obtained by watching the fern on one particular night in the year at an hour when all honest folks ought to be in bed and

involved the calling up of Old Nick himself, made little difference to these simple-minded wights intent upon securing unearned dividends. In these degenerate days, many another man has not scrupled to raise the Devil for similar purposes, though not as in the ancient days to the poetic accompaniment of watching the fern on Midsummer night.

By the time the wiseacres got around to giving a scientific name to our fern they seem to have regarded it as merely the male half of a fern species, for its specific name is properly translated *male fern*. For a long time the bracken was regarded as the female half of the species, but that title is now considered by right to belong to a species of *Asplenium*—an assumption which the specific name of *filix-foemina* confirms. Though we now know this plant as the lady fern, its specific name clearly shows that it ought to be called female fern, instead. Doubtless the more aristocratic title was given it out of politeness is an age guiltless of the suffragette and when women, regarded as superior beings, had not begun to clamor for recognition as mere equals. The lady fern, like the male fern was often watched for fern seed, but doubtless with no better success than attended such efforts with the male fern as the object of solicitude. The practice, however, was sufficiently romantic to appeal to the imagination of poets and other visionary individuals and in consequence we have several references to fern seed in poetry and a bull from the Pope in prose, which latter forbids any communicant of the Church to experiment further with such inventions of the Evil One.

The male fern is widely distributed over the earth but not as widely as some opinions, "made in Germany" would have it. Dr. Christ in his "Ferkrauter der Erde" issued in 1897 insisted that our common margi-

nal shield fern, and even Goldie's fern were only forms of the more widely distributed species, but even those conservative fern students who are said to have difficulty in distinguishing a fern from a carrot, protested with much vigor and loquacity—especially the latter—against such summary proceedings.

The center of distribution for the male fern appears to be somewhere in northern Eurasia from whence it has spread to the colder parts of North America as well as tropic-ward along the mountains to the Himalayas, the East Indies, the Hawaiian Islands, The Azores, Cape Colony, Peru and many points between. Such a varied sweep of country has of course caused considerable variation in the plant to the great delight of the species makers who have tagged all of the varieties with specific names and have further enriched fern literature by divers animadversions concerning their specific validity as well as their opinion of the mental ability of anybody who opined otherwise.

The male fern is not uncommon in parts of Canada, but in the United States it has been found only occasionally. In the east it strays across the border into Vermont, and Michigan, and in the west, following the elevated country it has penetrated as far as Arizona and California. It has been occasionally reported from Ohio, Pennsylvania and other States, but the reports are very evidently due to immature fronds or immature collectors, perhaps both. Like Dr. Christ, the collectors have failed to distinguish between two very good species. The superficial resemblance of the male fern to the lady fern is quite as marked as its similarity to the marginal shield fern. When really found, however, it needs no very careful inspection to discover that it is different from either. There is much likelihood that it will be found at other points in our range,

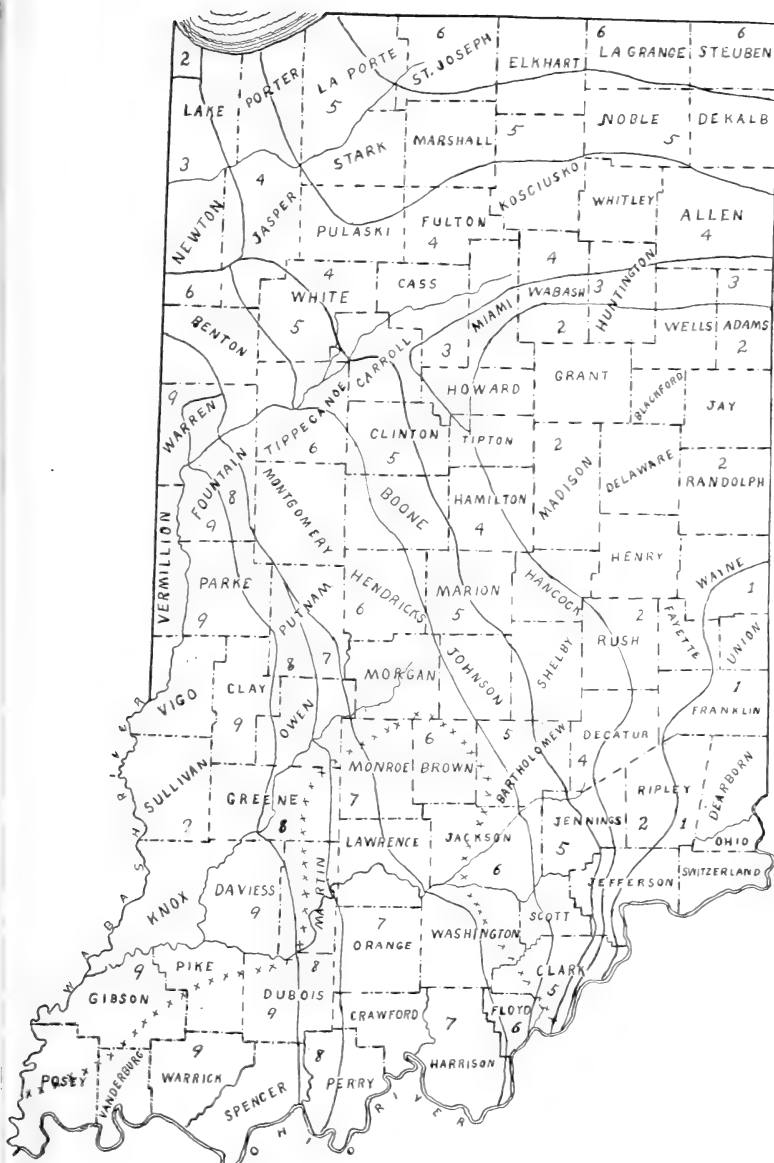
though it will never be recorded as common. We give as a frontispiece, a photograph of the plant made from living specimens in the Bruce Peninsula by Prof. A. B. Klugh. Here it is seen associated with the herb Robert and other shade plants, much as one would expect to find it.

THE FERN FLORA OF INDIANA.

BY F. C. GREENE.

Several papers containing lists of the Pteridophytes of Indiana have been published. The latest of these is that of Prof. Stanley Coulter published in 1900. Since that time species new to the State have been found and more data regarding the distribution has been gathered. These facts seem to warrant the publication of a revised list bringing together the accumulated data. While the following list is not complete either with regard to number of species found within the State or their distribution, particularly the latter, it is believed the climate and topography will not permit the discovery of many additional species of ferns. In the more difficult group, the fern allies, it is probable that many other discoveries will be made.

The State of Indiana is included between 37°41' and 41°46' north latitude, and between 84°44' and 88°6' west longitude. It is bounded on the north by the parallel which is ten miles north of the southern extremity of Lake Michigan; on the east by the meridian of the mouth of the Great Miami River; on the south by the Ohio, and on the west by the Wabash River and the meridian of Vincennes. Its extreme length is 250 miles, its average width 145 miles, its area 36,350 square miles." (Indiana Geography by Chas. R. Dryer.)



SKETCH MAP OF INDIANA

For explanation of figures see page 115

The temperature as averaged from readings of fourteen years ranges between 49.9° Fahrenheit in the northern part of the State, 51.6° in the central and 54.2° in the southern. The average annual precipitation for the whole State as based on readings for ten years is 38.8 inches, being somewhat less than the average in the northern, and somewhat more than the average in the southern part of the State.

The geology of the State is rather simple. Strata of Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, Pleistocene, and recent age outcrop in the state. The strike is slightly west of north and the dip, averaging 20 to 25 feet per mile, is to the south of west owing to the Cincinnati uplift. Thus the oldest formation, the Trenton, outcrops in the extreme southeast corner of the State. The Ordovician, Silurian and Devonian rocks are largely limestones and shales, the lower Mississippian strata (Knobstone group) are largely shales and sandstones capped by the overlying Mississippian limestones, the thickest in the State. The latter are overlain by the Chester and Pennsylvanian, chiefly sandstone and shale. Folds and faults are almost entirely absent. Outcrops of the foregoing are largely confined to the southern part of the State, as the northern two-thirds is covered by the drift sheets of the Pleistocene.

"The topography * of Indiana is somewhat diversified. The northern part of the State is covered by ice plains, which are characterized by many lakes and swamp areas, with sluggish streams and no deep valleys or high hills, the broad plain being diversified only by the inequalities of the glacial deposits. These features characterize, in the main, the northern third of the State.

* Hopkins, T. C., A short description of the Topography of Indiana: 28th Ann. Rept. Ind. Dept. Geology and Nat. Res. 1903.

The middle third is somewhat more diversified. The eastern half is a broad rolling plain, with no prominent hills nor any very deep valleys. The streams in places run over the surface of the plain, and in places are slightly intrenched in it. In the western half of the middle third the streams are more deeply intrenched; the Wabash and some of its tributaries, as Sugar Creek, Pine Creek and others, have cut gorges 300 to 400 feet deep along parts of their courses. Some portions of White River and its tributaries are similarly intrenched.

The southern third or more of the State is much more diversified. The area is more deeply trenched by the streams, so much so that in places lower secondary plains have been formed, and the underlying rocks have stamped their character on the surface. As the strata have a low west and southwest dip, the more durable rocks form *cuestas* or sloping plateaus, with steep escarpments to the east on their outcropping edges, and long plains sloping gently to the west on the bedded surface. Between these escarpments are irregular plain areas on the softer strata. Newsom cites three of these *cuestas* and three lowland areas, the broadest one of which is on the west of the outcrop of the Coal Measures strata.

The upland sloping plateaus are in many places very much dissected and diversified by the numerous deep valleys cut in them, so that they form a mass of irregular hills. The area in most places along the outcrop of the Mansfield sandstone is very much broken, and along the eastern margin of the outcrop, where the sandstone caps the hills, the latter are high, steep and marked by many perpendicular cliffs and steep talus slopes. This belt of cliffs and gorges is markedly different from the Knobstone area further east which extends through

Brown, Monroe, Scott, Lawrence, Jackson, Washington, Clark and Floyd counties. As the name indicates, the hills are knobs or rounded hills, frequently high and steep but generally free from the perpendicular and overhanging cliffs which characterize the Mansfield plateau and limestone plateaus. The highest part of the State is in the vicinity of the "Summit," in Randolph County, about 1,285 feet above sea level. The next highest portion is thought to be the Knob district in Brown County, on the divide between the White and the Ohio rivers. The lowest part of the State is in the southwest part, at the junction of the Wabash and the Ohio rivers. There is very little flood-plain area along the Ohio River in Indiana. It is flanked by the deeply dissected border of the upland plain through which it has cut its deep valley.

"The broad outcrop of the Mitchell limestone. . . . , extending from the northwest central portion of the State, east of south to the Ohio River, is characterized best as having a sink-hole topography. It is a very cavernous region, and the openings from the surface into the caverns are basin-like or funnel-shaped depressions known as sink-holes. The many scores of the sink-holes give the area quite a pockmarked appearance."

Each of these areas contributes to the diversity of the flora. The drift-covered plains contain about 1,000 lakes, many marshes and Tamarack bogs, exhibiting the northern bog type of flora. The northern part of the State contains another type of topography not mentioned in the foregoing sketch, that of the sand dunes around the southern end of Lake Michigan, which has been shown to possess a xerophytic type of flora. In the southern part of the State the Knobs exhibit floras peculiar to both dry barren hills and deep wooded ra-

vines. This part of the State also contains many limestone and sandstone cliffs. In the southwestern corner, there occur Cypress swamps formerly covering about 20,000 acres but probably much less than that at present. The latest and most complete flora of Indiana is that of Prof. Stanley Coulter. * This brought to date all previous lists.

The information contained in Coulter's catalog has been incorporated in the present paper. The writer has published lists for Monroe, Kosciusko, Greene, Lawrence (Indiana University farm), Martin and Orange, Floyd and Crawford counties in the *Fern Bulletin*. † All citations not otherwise accredited are those of the writer.

The nomenclature and classification used is that of Maxon, ‡ modified by the Editor to conform with that used in other States lists. To Mr. C. C. Deam, Secretary of the Indiana State Board of Forestry, Prof. J. M. Van Hook, Assistant Professor of Botany at the Indiana University and Mr. Wm. R. Maxon, of the Smithsonian Institution, the writer wishes to express thanks for aid rendered and to the Editor for the suggestion of the undertaking.

OPHIOGLOSSACEAE.

OPHIOGLOSSUM VULGATUM L. Reported by Coulter from Jefferson, Crawford, Gibson and Monroe counties, all in the southern part of the state. Blatchley reports it rare in Monroe County. A large colony was recently found near Gary, Lake Co., by W. A. Poyser.

* 24th Ann. Rept. Ind. Dept. Geol. and Nat. Res. 1899. pp. 553-1002. 1909.

† See Vol. XVI, pp. 16-69 and Vol. XVII, pp. 12-15.

‡ Maxon, Wm. R.: A list of the ferns and fern allies of North America north of Mexico, with principle synonyms and distribution. Proc. U. S. Nat. Museum. Vol. XXIII, pp. 619-651, 1901.

- OPHIOGLOSSUM ENGELMANNI Prantl. Reported by Maxon, no specific locality being given.
- BOTRYCHIUM SIMPLEX E. Hitchcock. Clute found quite a colony of this species on a low, sandy ridge at Glen Park, Lake County, on May 30, 1910 at which time they were in full fruit.
- BOTRYCHIUM DISSECTUM Spreng. Reported by Deam from LaPorte, Owen, Porter and Wells counties. Maxon and Britton both report it from Indiana.
- BOTRYCHIUM OBLIQUUM Muhl. Probably occurs in favorable locations throughout the State as it has been reported from both northern and southern counties.
- BOTRYCHIUM VIRGINIANUM (L.) Found in practically every county in which lists have been made. Much more common than any other species of the genus.

OSMUNDACEAE.

- OSMUNDA REGALIS L. Occurs in favorable locations throughout the State. Reported from Knox (*Spillman*), Vigo and Monroe (*Blatchley*), Hamilton (*Wilson*), Clark, Jackson, Noble, Steuben and Wells (*Deam*), Jefferson (*Coulter*), Lake (*Clute*), Floyd and Kosciusko.
- OSMUNDA CLAYTONIA L. Probably slightly less common than the preceeding. Vigo (*Blatchey*), Monroe (*Blatchley and Woodburn*), Gibson (*Coulter*), Brown and Owen (*Deam*), Lake (*Clute*), Greene and Kosciusko.
- OSMUNDA CINNAMOMEA L. More abundant than either of the preceeding. In swamps in Dubois County reaches a great size. DeKalb, Hancock, Lake and Wells (*Deam*), Vigo and Monroe (*Blatchley*), Steuben (*Bradner*), Jefferson and Montgomery (*Coulter*), Lake (*Clute*), Kosciusko.

POLYPODIACEAE.

POLYPODIUM VULGARE L. Confined largely to that part of the State in which outcrops of rock occur. Only one exception to this is known, that of a report from Steuben by Bradner. Crawford, Parke, Putnam and Warren (*Deam*), Montgomery and Parke (*Coulter*), Monroe, Martin, Greene and Clark.

POLYPODIUM POLYPODIODES L. One of the rarest species in the State. First reported by Williamson "upon oak trees and cliffs near the Ohio River in Perry County, Indiana." Clark, Floyd, Perry, Gibson, Posey and Jefferson (*Coulter*), Posey (on a Burr Oak (*Deam*)) and Orange. All these counties with the exception of the last border on the Ohio River, and Orange is but one county from the river.

ADIANTUM PEDATUM L. One of the common species of the State. Recorded from all parts of the State.

PTERIS AQUILINA L. According to Coulter this species occurs throughout the State. Recorded from Lake, Steuben and Wells (*Deam*), Floyd, Kosciusko and Monroe. In the northern counties it is found in marshy places. The writer found it near the summit of the Knobs in Floyd County.

CHEILANTHES LANOSA (Michx.). This species was recorded from Gibson County by Schneck. Coulter in the introduction of his list questions its occurrence in the State but includes it in his catalog. Deam, who now has Dr. Schneck's herbarium, writes "Neither is there a specimen of *Cheilanthes lanosa* in Dr. Schneck's herbarium. I really believe Schneck has mistaken *Woodsia obtusa* for *Cheilanthes*." The species is included in this list on the evidence given above, but in any case, must be considered rare.

PELLAEA ATROPURPUREA (L.). Confined to the southern counties in which rock outcrops occur. Report-

ed from Crawford, Jefferson and Warren (*Deam*), Monroe, Floyd, Crawford, Harrison, Clark, Martin and Orange.

WOODWARDIA VIRGINICA (L.). Found in the northern counties. Reported from Lake and LaPorte (*Coulter*), Lake, Marshall and Steuben (*Deam*), and Kosciusko.

ASPLENIUM PINNATIFIDUM Nutt. Apparently confined to sandstone cliffs in the southern counties. Gibson (*Coulter*), Crawford (*Deam*), Monroe, Martin and Dubois.

ASPLENIUM EBENOIDES R. R. Scott. Probably the rarest fern in the State. Reported from Jefferson (*J. M. Coulter*) and Crawford (*Blatchley*).

ASPLENIUM PLATYNEURON (L.). Reported from the southern two-thirds of the State where it seems to be one of the common species. Also reported from Steuben, in the northeast corner, by Bradner.

ASPLENIUM TRICHOMANES L. Has about the same range and habitat as *A. pinnatifidum*. Reported from Gibson (*Schneck*), Crawford (*Deam*), Monroe, Greene and Martin.

ASPLENIUM ANGUSTIFOLIUM Michx. Occurs throughout the State but is probably more abundant in the southern part.

ASPLENIUM RUTA-MURARIA L. One of the rarer species of the State. Recorded by Coulter from Jefferson, Clark and Floyd. Deam also reports it from Jefferson, covering some of the large detached limestone rocks north of Madison on the "Michigan" road.

ATHYRIUM THELYPTEROIDES (Michx). Occurs throughout the State but is probably more abundant in the southern part.

- ATHYRIUM FILIX-FOEMINA (L.). The range of this species seems to include the entire State but it appears to be abundantly only locally. Recorded from Allen, Crawford, DeKalb, Kosciusko, Vermillion and Wells (*Deam*), Brown (Ind. Univ. Herb.), Lake (*Clute*), Floyd, Monroe and Lawrence. *Deam* reports var. *angustatum* from Wells; var. *fissidens* from Noble and var. *ovatum* Roth. from Wells and Blackford.
- CAMPTOSORUS RHIZOPHYLLUS (L.). Common in that part of the State in which outcrops of limestone occur, i. e. the southern.
- PHEGopteris POLYPODIODES Fee. One of the rarest species in the State. Reported only from Putnam by Underwood.
- PHEGopteris HEXAGONOPTERA (Michx.). Commonly reported from the southern part of the State and less commonly from the northern, but doubtless occurs throughout the State in favorable situations.
- PHEGopteris DRYOPTERIS. Fee. There is but a single record of this species in the State. It is reported from Allen County by Sanford.
- NEPHRODIUM NOVEBORACENSE (L.). Apparently not very abundant. Recorded from Clark, Kosciusko, Jennings, Noble, Steuben, and Wells (*Deam*), Floyd, Lawrence and Monroe.
- NEPHRODIUM THELYPTERIS (L.). With one exception, that of Vigo (*Blatchley*), this species seems to be confined to the northern part of the State. In Kosciusko County it is the most abundant species and is probably equally abundant in the other northern counties.
- NEPHRODIUM CRISTATUM (L.). Reported only from a few northern counties. DeKalb and Porter (*Deam*), Marshall (Nat. Herb.), and Kosciusko (rare).

- NEPHRODIIUM GOLDIEANUM (Hook.). Common only very locally. Reported from DeKalb, Huntington, Owen and Steuben (*Deam*), Monroe, Greene, Floyd, and Martin.
- NEPHRODIIUM FILIX-MAS (L.). One of the rare ferns of the State. Reported only from Wells by *Deam*.
- NEPHRODIIUM MARGINALE (L.). Apparently to be found only in the southern half of the state where it is not uncommon in favorable locations. Recorded from Morgan, Owen and Warren (*Deam*), Putnam and Vigo (*Blatchley*), Monroe, Greene, Floyd and Martin. *Deam* reports var. *elegans* from Parke and Putnam.
- NEPHRODIIUM SPINULOSUM (Retz.). Reported by *Deam* from DeKalb, Huntington, Noble, Parke, Porter, Steuben and Wells.
- NEPHRODIIUM SPINULOSA INTERMEDIUM (Muhl.). Probably occurs throughout the State. Recorded from counties in all parts of the State.
- NEPHRODIIUM BOOTTII (Tuckerm.). This is apparently one of the rarest species of the State. It has been reported from Noble and Wells by *Deam*. In the Indiana University herbarium there is a specimen from one of the southern counties.
- POLYSTICHUM ACROSTICHOIDES (Michx.). Abundant throughout the State. The var. *incisum* apparently has the same range as the species.
- CYSTOPTERIS BULBIFERA (L.). Reported from many counties in the southern two-thirds of the State, but not north of Huntington County. In favorable situations it is sometimes found abundantly.
- CYSTOPTERIS FRAGILIS (L.). According to Coulter, this species is scarce, but in the experience of *Deam* and the writer, it is one of the most abundant and

widely distributed species. It is included in nearly every county list.

ONOCLEA SENSIBILIS L. Distributed throughout the State in marshy places. Recorded from Lake, Owen and Wells (*Deam*), Monroe and Vigo (*Blatchley*), Hamilton and Marion (*Coulter*), Clark, Floyd and Martin. It was found by the writer growing on a wet cliff of New Albany black shale on Silver Creek, Floyd County.

ONOCLEA STRUTHIOPTERIS (Hoff). Very rare in Indiana. Recorded only from Montgomery by Coulter
WOODSIA OBTUSA (Spreng.). Common in the southern half of the State. Deam reports it as far north as Wells.

DICKSONIA PUNCTILOBULA (Michx.). With the exception of a record of this species from Steuben by Bradner, it seems to be confined to the southern counties. It is reported from Gibson (*Schneck*), Martin, Floyd and Clark. In the latter it forms large clusters on the black shale cliffs of Silver Creek

SALVINIACEAE.

AZOLLA CAROLINIANA Willd. Reported by Coulter. No specific locality mentioned.

EQUISETACEAE.

EQUISETUM ARVENSE L. This species has been reported from counties in all parts of the State and probably is to be found throughout in favorable situations. Scovell and Clark report var. *decumbens** and var. *pseudosilvaticum* * from Marshall and Deam reports var. *boreale* Bong. from Allen.

EQUISETUM FLUVIATILE L. Reported from Vigo (*Blatchley*), Lake (*Hill* and *Deam*), Kosciusko (*Clark* and *Deam*), Marshall (*Scovell* and *Clark*).

* These and other species reported by Scovell and Clark are identified by A. A. Eaton and are in the Smithsonian Institution herbarium.

EQUISETUM ROBUSTUM A. Br. According to Coulter this species occurs in counties along the Ohio. Recorded from Gibson by Schneck, and from Marshall by Scovell and Clark.

EQUISETUM HYEMALE L. Recorded from Lake, Noble and Wells (*Deam*), Vigo and Monroe (*Blatchley*), Steuben (*Bradner*), and Kosciusko (*Clark*). Deam reports var. *affine* from Allen, Noble and Fountain.

EQUISETUM LAEVIGATUM A. Br. Reported from Lake (*Hill*), Marshall (*Scovell & Clark*), Marion and Steuben (*Deam*).

EQUISETUM VARIEGATUM Schleich. Reported only from Lake by Hill.

LYCOPODIACEAE.

LYCOPODIUM POROPHILUM Lloyd & Underw. This species was originally described from Indiana. It has been found at Fern, Putnam County by Wilson, on a sandstone cliff. Deam also found a few specimens on a high, dry cliff in Crawford County.

LYCOPODIUM LUCIDULUM Michx. Reported from Putnam (*Wilson and Deam*), Steuben (*Bradner and Deam*), Kosciusko (*Clark*), Parke and Porter (*Deam*).

LYCOPODIUM INUNDATUM L. Reported from Steuben by Bradner and Deam, Lake (*Hill*), Marshall (*Scovell & Clark*).

LYCOPODIUM OBSCURUM L. Coulter records this species from Lake and Montgomery.

LYCOPODIUM COMPLANATUM L. Reported from Lake, LaPorte, Putnam and Monroe counties by Coulter.

SELAGINELLACEAE.

SELAGINELLA RUPESTIS (L.). Probably frequent in all parts of the State in favorable situations but not commonly reported by collectors. Reported from Lake (*Hill*), Gibson and Montgomery (*Coulter*).

SELAGINELLA APUS (L.). Recorded from Gibson, Jefferson and Tippecanoe (*Coulter*), Kosciusko (*Clark*) and Marshall (*Scovell and Clark*).
New Albany, Ind.

EXPLANATION OF MAP.

*****—Southern limit of drift.

1. Hudson River limestone and shales.
 2. Niagara shales and limestone.
 3. Lower Helderberg and waterlime.
 4. Corniferous limestone.
 5. New Albany black shale.
 6. Knobstone.
 7. Mississippian limestone.
 8. Mansfield sandstone.
 9. Pennsylvanian (shale and sandstone).
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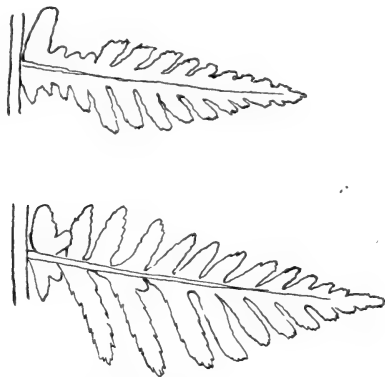
RARE FORMS OF FERNWORTS—XX.

THE FORMS OF EBONY SPLEENWORT.

The occurrence of forking and cut-leaved forms may be predicated in almost any species of fern; indeed, considering the venation, the very framework upon which the green tissue is laid down, the wonder is, not that such forms occur, but that they do not appear more frequently. It is a general tendency in all vegetation to be more deeply lobed and dissected when plenty of food is present, and when particularly luxuriant specimens are encountered, these forms may be expected. On the other hand, a lack of food may produce other aberrant forms of fronds, but here the variations run in different directions.

The variations in the cutting of the ebony fern (*Asplenium ebeneum*) are more than usually pleasing, due perhaps to the clear cut outline of typical fronds.

Even normal plants exhibit a wavy margin on the pinules and this, accentuated in various degrees, has given us the most noteworthy variations of this fern. Away back in 1873, when the *Torrey Bulletin* was a little coverless eight-page pamphlet, Lewis H. Miller found near Wading River on Long Island specimens which he called the variety *serratum*. We cannot say that he named and published his variety as such things go at present, for all that is said of it is said by the editor as follows: "Mr. Miller reports * * * also specimens of *Asplenium ebeneum* Ait., with the fronds



Abnormal pinnae of Ebony Fern.

wider than usual and the segments very sharply serrate which he proposes to ticket at Dr. Gray's suggestion as Var. *serratum*." Only access to Mr. Miller's specimens which if preserved at all are probably in the herbariums at Harvard or Columbia, can show how deeply the fronds are serrated, and whether more recently described forms are identical with his specimens. It is likely, however, that the serration is not very extensive, else an acute fern student like Mr. Davenport would not have given a new name to a deeply cut form. In

Davenport's variety *Hortonae* the pinnae are very broad for their length and must be described as pinatifid or nearly twice pinnate rather than serrate. It is the most extensively dissected form yet discovered and a very handsome and decorative fern. Between the extremes marked out by Miller's *serratum* and Davenport's *Hortonae* there is room for much variation and such forms are frequently found. Pinnae from two different fronds of this kind found by W. A. Poyser in Montgomery County, Pa. are here illustrated. These are certainly not the form *Hortonae* nor yet the form *serratum*. Whether they have been described or not, depends upon specimens to which the present writer has not access. It is known, however, that E. C. Howe once named a form of this fern *Asplenium ebeneum* variety *incisum* and this has been seized upon as a pretext for substituting *incisum* for *Hortonae* in the name of the most deeply cut form. It is possible, however, that *incisum* more nearly represents the form here illustrated in which case *Hortonae* ought to have good standing in court.

A few years ago, some of the more iconoclastic fern students dug up the specific name *platyneuron* which they wished substituted for the more appropriate name of *ebeneum*. This was not a new discovery, however. In 1878, D. C. Eaton called attention to it in his "Ferns of North America" in these words: "Although the Linnaean name for the present species is unquestionably the oldest, it is scarcely probable that those authors who are disposed to insist upon an inflexible law of priority will attempt to replace the name which has been accepted by nearly all botanists for nearly a century by one so utterly inappropriate as *platyneuron*." All of which shows how much better Eaton knew ferns than fern students.

EVERGREEN FERNS.

It is interesting to note the behavior of different ferns when cold weather comes upon us. Many are killed outright, but others last until the following year. After a frost it is useless to look for *Phegopteris hexagonoptera* or *Dicksonia*. *Adiantum pedatum* survives a few frosts but it is soon brown and dead. In many ferns, only the fertile fronds, or at least the fertile parts of the fronds, die in winter. *Aspidium acrostichoides* is a familiar example. *Lygodium palmatum*, *Aspidium cristatum*, *Woodsia obtusa*, *Botrychium ternatum* and others act in this way. The latter species turns to a reddish-bronze color and is very much prettier than when green. When the fertile part begins to die, it is in almost all cases at the top of the frond where it begins to turn brown. The only exception to this that I know of is *Lygodium palmatum*.

Some ferns do not seem to know whether to die or not. In *Asplenium ebeneum* the fertile fronds frequently remain green the entire winter. Usually all the fronds of this species become very much bleached and covered with whitish spots and blotches. We notice the same thing with *Woodsia obtusa* at times. The fertile fronds of the latter usually die, but the only thing that seems to stop its growth is freezing weather. This fern and *Asplenium trichomanes* seem to put forth the young fronds a little more on every good warm day during the winter. Sheltered in the clefts of rocks, and receiving warmth from them, since in winter the ground is always several degrees warmer than the air, they take every opportunity to grow. The fronds of *A. trichomanes* usually remain green, but one thing is quite noticeable in pressed specimens—those which are collected in winter lose their pinnae very readily, the

pinnae of summer specimens being less loosely jointed to the rachis.

Of the ferns which die down in the winter, the *Osmundas* usually lose their pinnae. It would be interesting to note whether there are changes similar to those in the leaf stems of deciduous trees and shrubs causing the fall of the pinnae. *Pellaea atropurpurea* is another of the evergreen ferns but its fronds become more or less brown in spots as the winter advances. In *Polypodium vulgare* the texture of the pinnae is very loose and in cold weather the fronds curl up, rachis as well as pinnae becoming more or less twisted together and the epidermis of the underside of the frond seems to separate and is very loose and wrinkled. On the return of warmer weather the fronds resume their usual appearance. In the spring the fronds of the previous year begin to drop off. Everyone has no doubt noticed that during the winter the fronds of *Asplenium marginale*, and *A. acrostichoides* lie for the most part flat upon the ground. On examining a stem at the base it will be seen that it is very weak and hollow except for the vascular bundles running through it. I do not know whether the snow breaks the stems and then allows water and frost to hollow it or whether the stem is first weakened and allows the frond to fall over so that the snow will protect it from too severe cold.—*C. E. Waters in Linnacan Fern Bulletin, Vol. 4.*

PTERIDOGRAPHIA.

FERNS FOR THE HOUSE.—Not every species of fern will endure the dry air, extremes of temperature and occasional neglect that is its fate when introduced into cultivation in the house, and yet those who select plants for fern dishes, pot plants and the like, seldom take this fact into consideration. The first fern likely to

be selected is some species of maiden-hair (*Adiantum*) which is about the least fitted of any to endure house conditions. There are a few species of this genus that might be expected to thrive in such a position but they are not grown by the florist. His specimens are certain to be those that prefer or demand, shade and a moist air. The sword fern (*Nephrolepis*), which dealers with an eye to business call the Boston fern, makes a good house plant because it can endure considerable drouth having become accustomed to such things from generations of life upon the branches of trees or fallen logs in the tropical forests. The holly fern (*Cyrtomium falcatum*) of the florist is also able to endure house conditions, its thick, glossy leaves being provided with an epidermis that prevents the rapid loss of water. A fern not often seen in the house though well adapted to life there, is the saw-fern (*Pteris serrulata*). It has long been known as a garden plant and is now spread nearly around the world in the tropics but is supposed to have come originally from China. It is fond of growing on old walls and finds the dry air of the modern house quite to its liking. It will grow and put forth new fronds throughout the winter. Another fern, common in cultivation, which cannot be named by the writer because he has never seen a fruiting specimen, is apparently a species of *Asplenium*, regarded as being of Japanese origin. It appears to be quite hardy and able to endure any ordinary winter when left to itself out of doors, but in the house it grows strong and green and is not affected by the lowered night temperatures that occasionally prove the undoing of less rugged plants. Nearly fifteen years ago, this fern was reported as naturalized in the vicinity of New York, having escaped from some near-by greenhouse, but if its name is known the fact

seems never to have been put on record. Ferreting out the name of this species might prove an interesting task to some student of foreign ferns.

BLACK SPLEENWORT IN AMERICA.—An interesting note, in connection with the recent finding of a Himalayan fern (*Asplenium alternans*) in the United States and the suggestion that another American species (*A. Glenniei*) may prove to be identical with the Old World *A. exiguum*, is found in a recent publication from the United States National Herbarium, wherein William R. Maxon expresses the opinion that the recently described *Asplenium Andrewsii* is in reality a form of the European black spleenwort (*A. adiantum-nigrum*). He says "If we admit the various forms distinguished by Milde, Luerssen, Christ, and others as constituting but a single highly variable species, there seems to be no logical ground for regarding *A. Andrewsii* as other than a geographical phase of *A. Adiantum-nigrum*." When one comes to consider the matter it is astonishing to discover how many spleenworts are common to both sides of the world. If we admit the identity of *Glenniei* and *exiguum* the list includes besides, *alternans*, *ruta-muraria*, *septentrionale*, *trichomanes*, *viride*, *filix-focmina* and *thelypteroides*. It may be noted also, that *Asplenium fontanum* and *A. marinum* have been reported from America upon what have heretofore been considered insufficient grounds. Possibly their claims may yet be considered valid.

CRESTED FERNS.—The natural venation of ferns is arranged after a forking pattern and in consequence one of the commonest forms of variation is that in which the pinnules pinnae or fronds fork at the tip. When, as is most frequently the case, the parts divide

into two equal branches, the form is spoken of as a forked form, but when the forking is multiplied it is called crested. In the early numbers of this magazine particularly volumes IV and V, thirty-seven different species are recorded as having forking fronds. So far as we are aware no attempt was made to give these forms scientific names, but with crested forms the case is somewhat different since the division of the frond is more complicated and often results in specimens of considerable attractiveness. Of these latter, several have been given distinctive names. Since several of these names are not self-explanatory the whole list for the American ferns may be given. Among the *Nephrodiums* a crested form of *N. cristatum* is known as f. *pufferae*, and a similar occurrence in *N. marginale* is f. *Davenportii*. Maxon gave the name *cristata* to a form of *Dicksonia*, Trelease named a crested form of *Pellaea atropurca*, f. *cristata*, and A. A. Eaton gave the name of *ramosa* to a partly forked, partly cristate form of *Woodwardia radicans*, or *W. spinulosa* as recent fern lists have it. Eaton also named *Polystichum munitum* f. *flabellatum* and the editor of this magazine has named a similar form of the ebony fern *Asplenium ebeneum* f. *furcatum*. Our two commonest species *Polypodium vulgare* and *Athyrium filix-foemina* have of course, long had named crested forms. Clarence Lown, an early American student of ferns gave the name *cristatum* to a form of *P. vulgare*, though according to Gilbert this is properly *bifido-multifidum*. A crested form, however, is known in England and bears the name of *cristatum*. Our very common Christmas fern (*Polystichum acrostichoides*) appears never to have had named a crested variety though several such forms have been reported. The only advantage to be gained by giving a name to these forms, is that it

enables them to be handled in print more easily. Anyone having a taste for naming forms of this kind should have no trouble in securing material for the work if a careful search is made in the haunts of the ferns.

CRESTED MARGINALE SHIELD FERN.—In the account of the forms of the marginal shield fern (*Nephrodium marginale*) published in the April number of this magazine no mention was made of a crested form of this fern described from New England by Floyd in 1902. Its omission was an inadvertence upon the part of the editor who overlooked the fact that the crested form of this species had received a name. The form in question was described in *Rhodora* for December, 1902 and given the name of *Nephrodium marginale* f. *Davenportii* in honor of the late George E. Davenport. A curious failure to append the author citation runs through all the published references to it that we have access to. It is mentioned by both Eastman and Waters without mention of the describer. The reason for this is doubtless the fact that crested forms are likely to be found, indeed are expected to be found, in all species of ferns and so little attention is paid to them.

LIVING FERNS FOUND FOSSIL.—As a usual thing, the fossil ferns belong to extinct species that may suggest more or less close relationships to present day forms but are not identical. Such generic names as *Asolophyllum* and *Asplenites* indicate relationships of this kind. For the most part, the ferns now inhabiting the earth belong to recent genera and are not found fossil. There are, however, a considerable number of fossils that are regarded as identical with modern genera, and not a few have been assumed to belong to existing species. The fern genera reported among American fossils are *Ancimia*, *Asplenium*, *Blechnum*,

Davallia, *Dicksonia*, *Aspidium*, *Gleichenia*, *Goniopteris*, *Gymnogramma*, *Hymenophyllum*, *Lygodium*, *Onoclea*, *Osmunda*, *Phegopteris*, *Polypodium*, *Woodwardia* and *Pteris*. Among the fern allies we note *Equisetum*, *Isoetes*, *Lycopodium*, *Salvinia*, *Ophioglossum*, *Selaginella*, and *Tmesipteris*. Among the species thought to be identical with living ones may be mentioned *Nephrodium argutum*, *N. Goldieanum* and *Onoclea sensibilis* and six species of *Equisetum* namely *arvense*, *laevigatum*, *limosum*, *robustum*, *scirpoides* and *sylvaticum*. The occurrence of these species in the fossil condition makes the link connecting modern and fossil ferns seem much more real than ordinary and opens up a new view upon the continuation of the species. Apparently some of these forms, inflexible as they may appear, have nevertheless, been sufficiently flexible to adapt themselves to the many vicissitudes the race has encountered during the ages that have elapsed since their appearance upon the earth and enabled them to survive while multitudes of other species that started with them have gone down to oblivion and left no sign. In this connection it is well to remember, too, that many of the forms, once regarded as fossil ferns have been lately proved to be not ferns at all but fern-like seed plants.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in or omission from this list.

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EDITORIAL.

One volume of this magazine still remains to be issued before it joins *The American Botanist* to make a single larger publication. For this last volume we bespeak the same support that our readers have so readily given in the past. Although the magazine is almost irretrievably behind its dates, the numbers are sure to be issued some time during the year, if for no other reason than that its affairs must be closed up before the new journal can appear. Preparations for the 1912 volume are well under way and we can announce now that the numbers will contain at least four important fern floras. Those for Michigan, Massachusetts and Illinois are already promised and with the Indiana flora, published in this number, well covered the country from Maine and Ontario to Michigan, Iowa and Kentucky. Further south, Georgia and all the Gulf States are represented with the exception of Alabama and Mississippi and on the West Coast only Oregon fails to be included. Anyone possessing this series can get a better idea of the exact distribution of the fernworts than any single book can hope to present. In addition to the fern floras, there will be the usual number of other articles, rare forms of fernworts, pteridographia, etc. We trust that every one of our present subscribers will resolve to see the magazine through to the end.

* * *

If you do not find a bill in this number, it is an indication that your subscription will not expire until the magazine does. All others will be billed to the end of the year, but no farther. For the first time since the magazine began publishing we are not inviting subscribers to pay a few years in advance. Please do not

pay beyond the end of 1912. This refusing to take in good money when it is offered to him is about the hardest thing a publisher is ever called upon to perform; do not make it harder by sending more than the proper amount. But do not forget to send the amount due, else you will fail to receive the magazine. Since a hitherto lenient government has recently become very much peeved over second class rates, we have found it expedient to stop subscriptions as soon as they expire even if such action should cause delinquents to expire also.

* * *

This is about the last call for those who have incomplete sets to make them otherwise. We are willing at present to replace soiled, torn or missing copies with new ones, and to sell single volumes at 75 cents each. At the end of the year we will not break sets for anybody. If a subscriber, when renewing, chooses to order one or more back volumes he may have them at 50c a volume, but this price holds good only with renewals or new subscriptions to the volume for 1912 and does not include volumes earlier than volume 10. All the earlier volumes are worth more and the first six are out of print.

* * *

One of the stock arguments made by the agitators in the American Fern Society in favor of a society-owned journal was that thereby they would be spared the annoyance of a delay in the appearance of the numbers. A year's experience, however, has been sufficient to demonstrate the futility of their promises in this respect. The October issue appeared in December and the January one in March, a most astonishing state of affairs considering all the circumstances.

It is learned from the Annual Report of the American Fern Society that the "official organ" for 1911 cost about seventy-five dollars more than it would have cost, had the society not decided to permit its officers to try their hands at amateur journalism. An association like the Fern Society could do a great deal toward advancing fern study with that amount of money. That it failed to do anything whatever in this respect during the past year is possibly due to this lack of funds. Strange that the officers should be so taken up with their new plaything as to forget that the members expect something for their dues besides a publication devoted almost exclusively to exotic ferns. If the Society cannot get back to its former policy of doing something in the fern line it is doomed—publication or no publication.

RANGE OF CYSTOPTERIS.—The common bladder fern (*Cystopteris fragilis*) is well known to be pretty widely distributed over the earth. It is found in Japan, Cape of Good Hope, India, Alaska, the West Indies and nearly everywhere else except within the range of Britton's Manual where its place is taken by *Filix fragilis*. Possibly the most northern station for it in the world—certainly the northermost in America—is the one recorded by the collectors of the Peary Arctic Expedition. They report it as growing at Etah in Greenland, the last Esquimaux settlement on the road to the Pole. Etah is in 78° N. Latitude only twelve degrees from the top of the world. Probably it grows still nearer the Pole if there is anywhere suitable localities. Unlike most ferns it seems able to adapt itself to all kinds of climate, though in the tropics it does keep pretty well to the cooler, mountainous country. It is one of the first ferns to start into growth in spring and in many districts it is practically evergreen.

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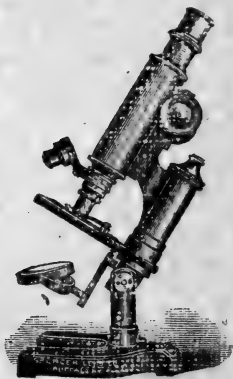
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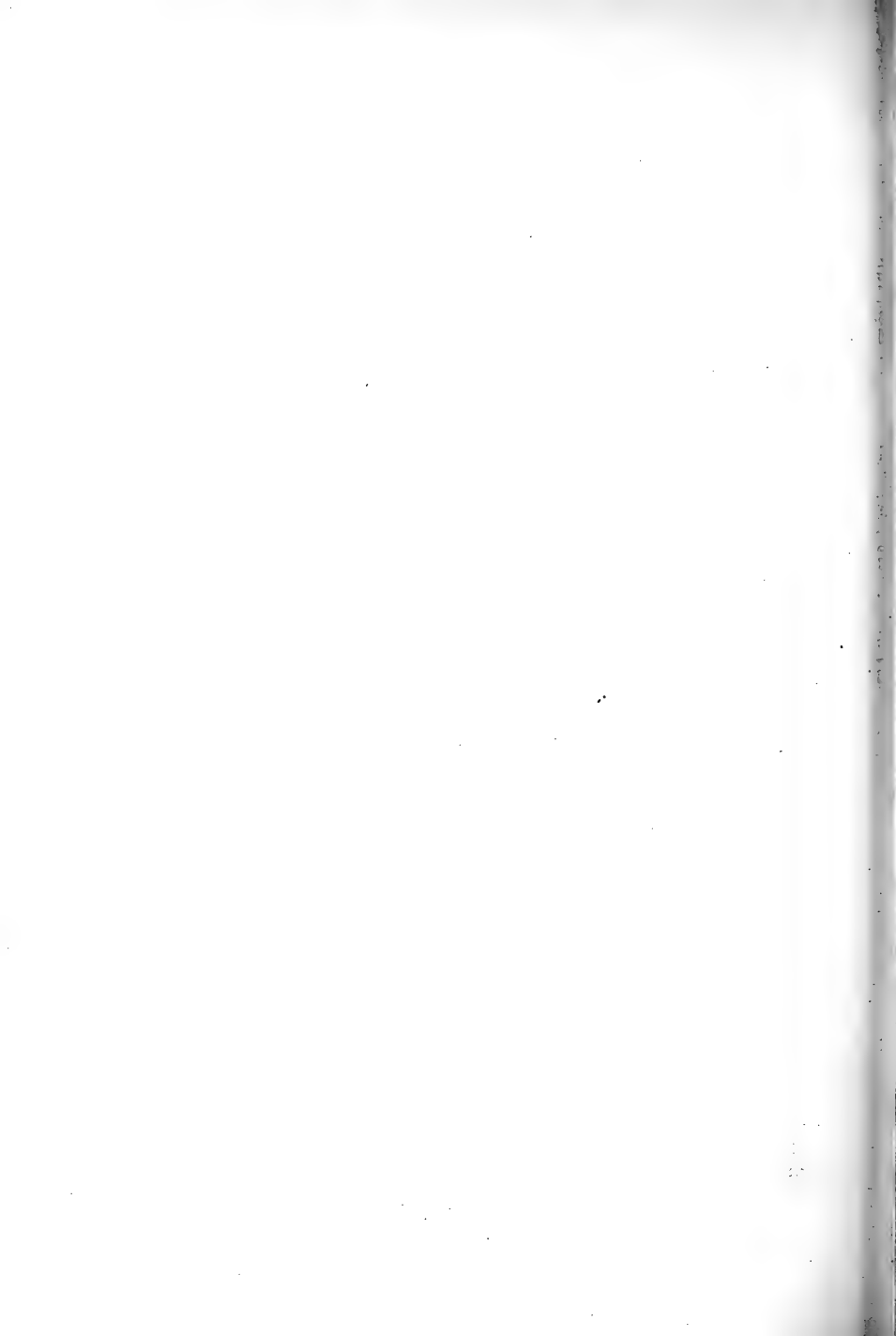
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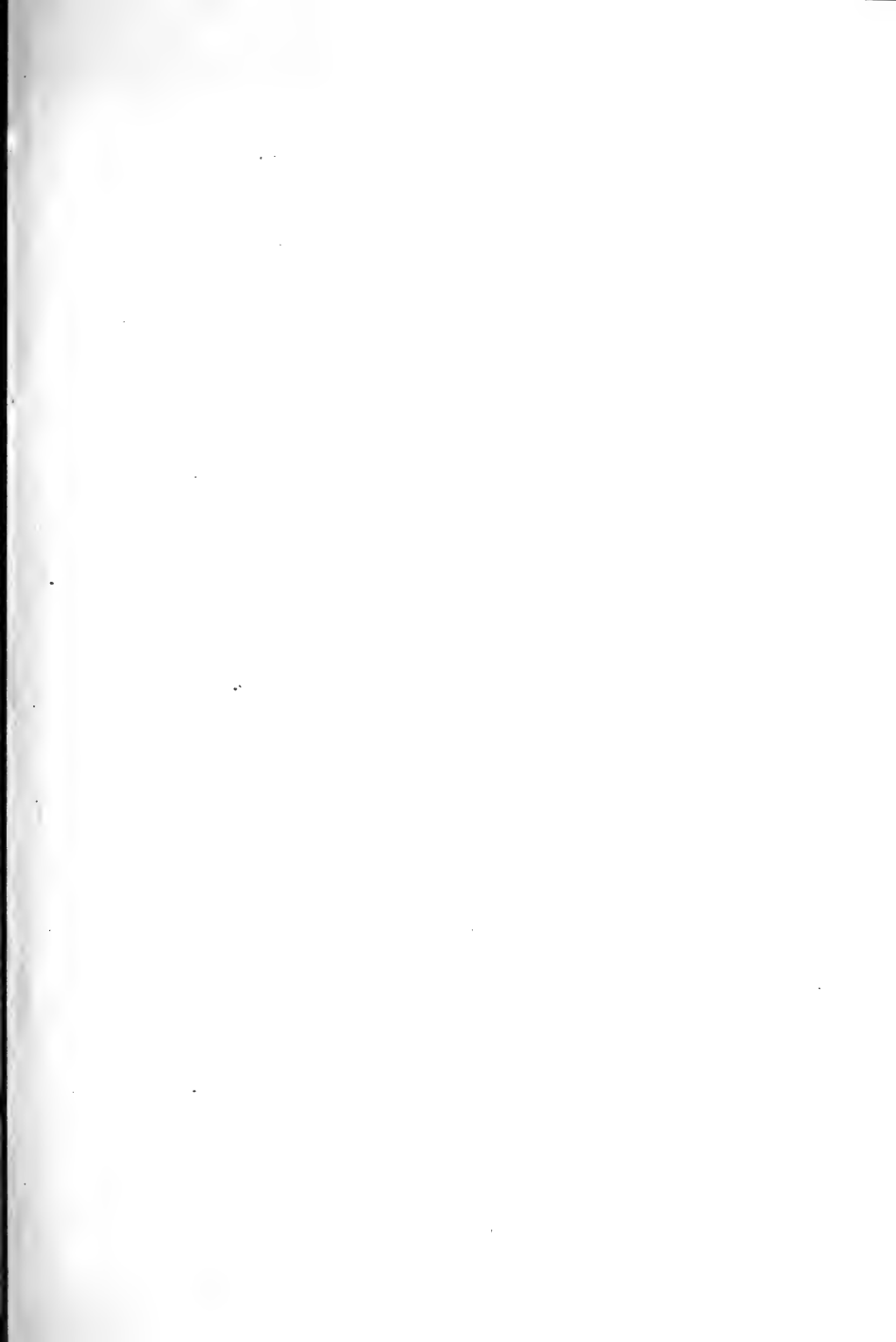
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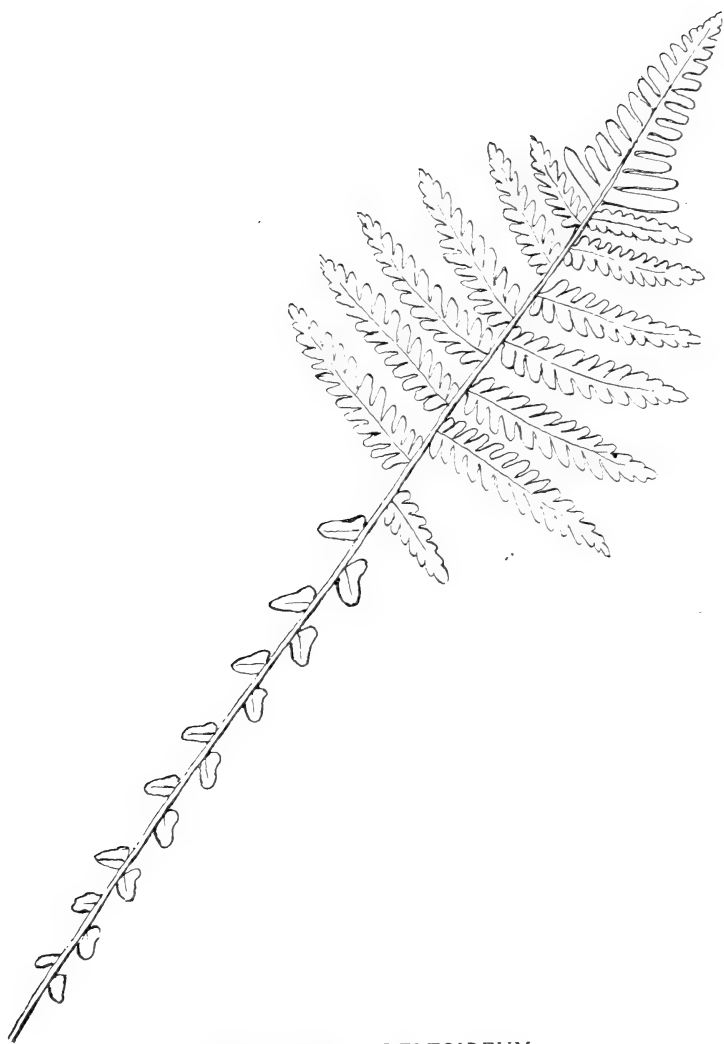
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Vol. XX

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No. 1

THE ROCK RELATIONS OF THE CLIFF-BRAKES.

BY E. J. HILL.

The note under Pteridographia in the *Fern Bulletin* for July, 1911, concerning *Pellaca gracilis* on sandstone and its unusual occurrence on any rocks except limestone, reminds me of a similar experience with it, and of another station to be added to the two that are mentioned. In July 1905, on an excursion with the Chicago Academy of Sciences, I collected this fern on a moist, shaded sandstone cliff outcropping on the sides of Liberty Hill, which overlooks the village of Oregon, Illinois. The prevailing rock here is the St. Peters sandstone. The Trenton Limestone lies next above, but did not outcrop at the point where the fern grew. The sandstone is ferruginous, usually soft and friable, but sometimes so hardened by the iron which forms the chief cementing material as to ring like a piece of old casting when struck by a hammer. Such was the character of the sandstone that formed the mass of Liberty Hill. The three other localities in Illinois—the only state in which I have yet found it—Kankakee, and in Cook County, Lemont and Sag Bridge, were on outcrops of Niagara Limestone.

As the relation of this slender cliff brake as well as of the larger *Pellaca atropurpurea* to the underlying rock is a matter of interest, it may be well to report my experience with this also, and draw some conclusions from their character. In another locality near Oregon on the same excursion, I collected this fern on the

sandstone rocks. It was a small colony, the few straggling stems presenting an appearance quite different from the nests or bunches one commonly finds when it grows on limestone. Again, in the summer of 1910, while spending a week studying the flora in the Dells of the Wisconsin river, near Kilbourn, Wis., I saw the cliff brake but once, a small bunch similar to the one at Oregon. The rock of the Dells is the Potsdam sandstone. Once before, in 1893, I took it from the sandstone cliffs bordering Lake Mendota, Madison, Wis. A note made at the time simply gives sandstone cliffs, but does not state whether the plants were growing on the Potsdam or the Madison sandstone, a name applied to a thinner bed in which more calcareous matter is mixed with the ferruginous than is the case with the cementing material of the Potsdam. The bearing of this will appear later on in the discussion. Attention is called to these facts since the common habitat of both the *Pellaeas* is stated to be limestone, or calcareous rocks, implying that lime is the principal ingredient. Gray's New Manual for *P. atropurpurea* specifies "dry calcareous rocks" only, and for *P. gracilis* (*Cryptogramma Stelleri*), "shaded chiefly calcareous rocks," thus according the latter a wider edaphic range. The statements in books that give habitats vary in regard to the ferns, but the more common one, as agrees with experience in general, is calcareous rocks.

In view of these facts and statements, it is well to examine the case more closely and see what are the edaphic and other ecologic relations of the two cliff-brakes. They are characterized in one of their features as growing on rocks. This may not necessarily mean that they are true lithophytes, or rock-plants, with rock as the sole substratum, but such is

doubtless the implication when they are discussed in their preferential relations to limestone or sandstone. It would seem to apply in but a very general way to *P. gracilis*. In the strict sense of the term it is not a lithophyte, or plant closely connected with a rock substratum. At least I do not find any connection between its roots and the underlying rock, however otherwise, if at all, they may be related. The roots may casually pass through the thin stratum of soil in which it grows and thus come in contact with the rock, but they show no adhesive nature. The rocks provide a lodging place for this layer of soil in which it takes root and shelters the delicate fronds from adverse conditions. The roots spread in a medium well supplied with humus. They are fine, with abundant fibers and root hairs for the absorption of nourishment. Besides it is usually associated with mosses, liverworts and other small plants adapted to such a habitat. These are its edaphic features and relations as I have found them, and from the character of its root-system, it would require essentially the same conditions anywhere. In its relations to moisture it is a mesophyte, since it demands a moderate supply of water. The locality may become dry in late summer from heat or lack of rain, but as it fruits in early summer its season of activity is over, the aerial parts may wither and disappear, and the tiny fronds be hard to find. In its relations to light it is a sciophyte or shade-plant. It is to be sought on shaded rocks, since the direct rays of the sun, which the common cliff-brake readily endures, are detrimental, or might prove fatal.

It is quite different in the case of *P. atropurpurea*. It is true xerophyte, capable of living under the driest of conditions. It is doubtless a good lithophyte, since any soil but the rock itself that may be found at

its root is a negligible factor in its life. All it seems to need is mere cranny or crevice or bit of shelf as a place for adequate fastening. A knife may be required to detach it, quite unlike the easy separation of a sod or bunch of *P. gracilis* with its associated bryophytes from the underlying rock. The roots are relatively coarse, strong and wiry, scantily if at all provided with proper rootlets. Where they come in contact with the rock they usually enlarge or flatten, frequently becoming more or less discoid at the end, perhaps the result of pressure, but useful in the capacity of hold-fasts. The dense cushion of flattened and wrinkled hairs and scales at the base of the stems is well adapted to conserve whatever moisture may have collected about the roots, and to retard its escape except by way of transpiration. The tufted habit, the blue-green color, the thickened or leathery leaf readily inrolling at the edge when the moisture is diminished, bespeak the true xerophyte. These characters are in marked contrast with the thin texture of the leaves, the palegreen or yellowish green color, the scattered habit of the stems of *P. gracilis*, in harmony with its mesophytic nature. Then in its relations to light the cliff-brake likes an open, sunny place, as it is a sun-plant, or heliophyte.

As to the chemical or nutritive relation of these ferns to the rocks with which they are commonly associated, or whether there are any, I have no data at hand to decide, nor do I know that it has ever been investigated experimentally. Such should prove a crucial test. That plants have peculiar relations of this kind to soils is generally acknowledged. This is evident from the names applied to plants characteristic of certain habitats, or to their likes and dislikes. Thus we find plants denominated halophilous, or lovers of salt, calciphilous and calciphobous, loving, or dreading and

avoiding lime, respectively; silicolous, such as live on a silicious substratum, or in a soil abounding in sand, mere dwellers as it were with a somewhat neutral character, since silex as nutrition for plants is on the whole a neutral substance. Some regard a calciphobous plant as in a sense the equivalent of one that is silicolous. This is explained by saying that plants do not avoid a calcareous and select a silicious soil, but are driven by competition with other plants away from a soil well supplied with calcium and usually richer, into one with much less of this element, such as a very sandy soil. Here may be found enough of calcium for actual needs, since they can do with less, and in addition are freed from competitors that are not so easily satisfied. This, on the whole, seems a more satisfactory explanation of the relations. As far as experiments upon the relations of plants to their habitats have been made, they appear to be determined more by the physical than by the chemical constitution of the soil, provided that it contains the ingredients a plant requires, and does not have in excess those that are injurious.

In accordance with this explanation, the two ferns, commonly calcicolous but sometimes silicolous, may be more closely related to this underlying rocks physically than chemically. If this need of calcium is greater than that of plants in general, it would have a bearing on their habitats. But *P. atropurpurea*, at least, since it lives in exposed places, must have a better chance to resist physically adverse conditions affecting its stability on a firm limestone basis than on the more readily disintegrating sandstone. In this way its infrequency on sandstone rocks may in a measure be explained.

Chicago, Ill.

THE FERN FLORA OF MICHIGAN

BY C. K. DODGE.

As one will see by referring to the map, Michigan in so many respects, is naturally one of the most favored spots known in the world. It is bordered and almost surrounded by four out of the five Great Lakes and their connecting streams, has over 1600 miles of coast line, perhaps over 5,000 small lakes, numerous small rivers, and consists of two main parts usually referred to as the Upper Peninsula and the Lower Peninsula. The State, large in area but very irregular in outline, lies between latitude 41° - $45'$ and 48° - $20'$, and longitude 82° - $25'$ and 90° - $34'$ and between these northern and southern parts, the temperature varies more than 7 degrees. The area approximates 58,900 square miles or 37,705,000 acres. It will be seen at once that a careful examination and study of the distribution of species from north to south will be very interesting and profitable.

To those not familiar with the whole history of the State, it appears very strange how two such large bodies of country, but so different in every respect and divided into two irregular parts by large lakes and straits, came to be joined together politically as one State. The circumstances and incidents bringing it about have passed into legend and history. It is seldom a Michigan historian treats the matter with seriousness, but rather makes light of the whole affair. It seems that Michigan was about to be admitted into the Union with a territory covering only the Lower Peninsula, when a lively dispute arose between Ohio and Michigan as to the boundary, which involved the possession of an east and west narrow strip of land covering in part the place where Toledo is situated. The kindly counsel of Uncle Sam was offered and fin-

ally agreed to, giving the strip in dispute to Ohio, while to Michigan was given the large area now usually called the Upper Peninsula. Ohio now has the strip of land with the great and progressive city of Toledo. Michigan has the Upper Peninsula with its many prosperous cities and immense mineral wealth. Both parties are happy. It is said "All's well that ends well."

But for want of space we cannot stop here to talk much about doubtful legends or State history, nor can we speak of its soils or interesting geology. The two peninsulas are very unlike. The Lower Peninsula is generally regarded as a level country, although very hilly in many places. On the west end of Lake Erie and from the foot of Lake Huron at Port Huron along the shore to Mackinaw City, sand dunes, seldom rising to the height of 40 feet, are numerous but mostly fixed and covered fairly well with vegetation. On the west side along the Lake Michigan shore from Mackinaw City to the south boundary, a part of which is so celebrated for fruit raising, sand dunes in many places are much more formidable, in some cases 400 feet and more in height, often changing location, invading and burying forests. The Upper Peninsula is in many places very rough and rocky with numerous deep, shaded and damp ravines, but is not considered as generally mountainous. In the northern part of Marquette county, in Keweenaw county, and in parts of Houghton and Ontonagon counties, the higher hills and rocks, usually parallel with the Lake Superior shore, are so rough and formidable as to be regarded by many as mountains. But the only genuine mountains in the State, are the Porcupines in the western part of Ontonagon county and extending into Gogebic county, near the Lake Superior shore, which rises over 1,000 feet in height. Small streams, often

cut deep into the drift and rock, are numerous, and damp rocky places are very abundant throughout. It would seem to be an ideal country for fern species, yet as will be noticed by referring to the list, reports are very meager.

So far as known there has been no systematic search for ferns throughout the State, or in localities of any size. No sooner does a botanist become prominent in this state than he is employed by the government, some prominent business interest, or educational institution, where his duties are such that he has little time for field work. No particular branch or line in the botany of this state has ever been well looked up except here and there in restricted areas. What should have been done or started over 50 years ago is yet left undone. This is especially the case with the Upper Peninsula. Much of what has been accomplished has been the work of outside botanists. In the last edition of the Michigan Flora appearing in 1904, after recounting what had already been done, Prof. W. J. Beal, then at the Michigan Agricultural College, said: "After all has been said and done, the study of the flora of the state at best can only be considered as fairly begun. By far the greater areas have not yet been seen by any systematic botanist and very few regions have been visited by one who is an expert in some one or more of the more difficult families." It is certain that the distribution of plants in this state has been uniformly neglected.

In the following list much valuable assistance has been received from O. A. Farwell, of Detroit, who has given much attention to the ferns of the state as well as to other plants.

POLYPODIACEAE.

POLYPODIUM VULGARE L. Common polypody. Not frequent in the Lower Peninsula, but plentiful on the edge of overhanging rocks along Lake Huron shore near Hat Point, Port Austin and Point aux Barques, Huron Co.; Grand Ledge, Eaton Co., *W. J. Beal*; near Hubbardston, Ionia Co., *C. F. Wheeler*. Said to be common throughout the Upper Peninsula.

PHEGopteris polypodioides Fée. Long beech-fern. In Lower Peninsula near Inland, Grand Traverse Co.; on rocks near Grand Ledge, Eaton Co.; Frankfort, Benzie Co.; Huron Co. *Dodge*; in Upper Peninsula on Isle Royale in Lake Superior, *Dr. A. B. Lyons*; Keweenaw Co., *O. A. Farwell*. Said to be generally common northward.

PHEGopteris hexagonoptera (Michx.) Broad beech-fern. One fine specimen only found in rich woods near Port Huron, St. Clair Co.; Flint, Genesee Co.; Hubbardston, Ionia Co.; Ann Arbor, Washtenaw Co.; Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*. Said to be frequent in the State.

PHEGopteris dryopteris (L.) Oak fern. Frequent in St. Clair Co. and reported to be common throughout the State farther north and west. "The commonest form in Keweenaw Co." *O. A. Farwell*.

Adiantum pedatum (L.) Maidenhair. Common throughout the State, usually in damp rich and shaded ground.

Pteris aquilina (L.) Common Brake. Abundant throughout the State in open dry ground or in swamps where it is often rank and much larger.

- PELLAEA ATROPURPUREA (L.) Purple Cliff-brake. Near Norway in Dickinson Co., Upper Peninsula. Apparently rare.
- CRYPTOGRAMMA ACROSTICHOIDES (R. Br.) American Rock-brake. Found only in crevices of rocks on Isle Royale and Caribou Island in Lake Superior.
- CRYPTOGRAMMA STELLERI (Gmel.) Slender Cliff-brake. South shore of Lake Superior; Pictured Rocks in Alger Co., Upper Peninsula, *G. H. Hicks*.
- WOODWARDIA VIRGINICA (L.) Virginia chain-fern. In swampy ground, St. Clair Co.; Huron Co. Frequent throughout the State.
- WOODWARDIA AREOLATA (L.) Net-veined Chain-fern. South Haven in Van Buren Co., *L. H. Bailey*. Apparently rare.
- ASPLENIUM TRICHOMANES (L.) Maidenhair spleenwort. In crevices of rocks, Houghton Co. and Keweenaw Co. in Upper Peninsula and on Isle Royale, in Lake Superior.
- ASPLENIUM PLATYNEURON (L.) Ebony spleenwort. Near Allegan, Allegan Co., *Miss Josie A. Williams*; near Williamston, Ingham Co., *O. A. Farwell*. Only stations known in the State.
- ASPLENIUM MONTANUM (Willd.) Mountain spleenwort. Near Clifton, Upper Peninsula, *O. A. Farwell*.
- ASPLENIUM RUTA-MURARIA (L.) Wall rue spleenwort. Keweenaw Co., Upper Peninsula, *O. A. Farwell*. Apparently rare.
- ASPLENIUM ANGUSTIFOLIUM (Michx.) Narrow-leaved spleenwort. Shaded banks of Black river, St. Clair Co., but rare; rich woods in Jackson Co., *S. H. & D. R. Camp*; Washtenaw Co., Genesee Co. Apparently infrequent.

- ASPLENIUM ACROSTICHOIDES (Sw.) Silvery spleenwort. Alma, Gratiot Co., *C. A. Davis*. Said to be frequent throughout the State.
- ASPLENIUM FILIX-FOEMINA (L.) Lady fern. Very common throughout the State. The form *angustatum* is common in the Upper Peninsula, *O. A. Farwell*.
- CAMPTOSORUS RHIZOPHYLLUS (L.) Walking fern. Alpena Co., in Lower Peninsula, *V. M. Spalding*. Keweenaw Co., *O. A. Farwell*; near Norway, Dickinson Co., Upper Peninsula, *C. F. Wheeler*. Apparently rare.
- POLYSTICHUM ACROSTICHOIDES (Michx.) Christmas fern. Shaded ground and river banks throughout the State.
- POLYSTICHUM LONCHITIS (L.) Holly fern. Woods, south shore of Lake Superior; Keweenaw Co., Upper Peninsula, *O. A. Farwell*.
- POLYSTICHUM BRAUNII (Spenner.) Braun's hollyfern. Keweenaw Co., Upper Peninsula, *O. A. Farwell*. Apparently rare.
- NEPHRODIUM THELYPTERIS (L.) Marsh shield-fern. Very common throughout the State in damp open or shaded ground.
- NEPHRODIUM SIMULATUM (Davenp.) Massachusetts shield-fern. Belle Isle, Detroit, Wayne Co., *O. A. Farwell*.
- NEPHRODIUM NOVEBORACENSE (L.) New York fern. In damp woods, St. Clair Co., Washtenaw Co.; Macomb Co.; Ionia Co.; Manitoulin Island.
- NEPHRODIUM FRAGRANS (L.) Fragrant shield-fern. Isle Royale in Lake Superior; Keweenaw Co., Upper Peninsula, *Dr. Lyons*.

NEPHRODIUM MARGINALE (L.) Evergreen wood-fern. Shaded hillsides, river banks and rich woods throughout the State.

NEPHRODIUM FILIX-MAS (L.) Male fern. Keweenaw Co., Upper Peninsula. Apparently rare.

NEPHRODIUM GOLDIEANUM (Hook.) Goldie's fern. Black river bottom in St. Clair Co.; Genesee Co.; Ionia Co., *C. F. Wheeler*; Shiawassee Co., *G. H. Hicks*; Gratiot Co., *C. A. Davis*. Oakland Co., *Brotherton* and *Farwell*.

NEPHRODIUM BOOTHII (Tuckerm.) Boott's shield-fern. In alder thickets, Ionia Co., Washtenaw Co., Lower Peninsula. Near Norway Dickinson Co., *C. F. Wheeler*. Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

NEPHRODIUM CRISTATUM (L.) Crested shield-fern. Frequent in swampy places throughout the State.

NEPHRODIUM CRISTATUM CLINTONIANUM (D. C. Eaton.) Clinton's shield-fern. Frequent in rich woods in St. Clair Co. and Huron Co.; Washtenaw Co.; Ionia Co.; Gratiot Co., *C. A. Davis*.

NEPHRODIUM SPINULOSUM (Muller.) Spinulose shield-fern. Rich woods in St. Clair Co. Common throughout the State.

NEPHRODIUM SPINULOSUM INTERMEDIUM (Muhl.) Spinulose shield-fern. Common in rich woods throughout the State.

NEPHRODIUM SPINULOSUM DILATATUM (Hoffm.) Spinulose shield-fern. Not noticed in St. Clair Co. Washtenaw Co.; Macomb Co.; Genesee Co.; Ionia Co.; Emmet Co.; and southward. The Michigan plant is referable to the form *Anadenium* Robinson.

CYSTOPTERIS BULBIFERA (L.) Bladder fern. Frequent throughout the State in damp rich woods and on moist shaded hillsides.

CYSTOPTERIS FRAGILIS (L.) Brittle fern. In damp woods and under overhanging rocks throughout the State. The form *dentata* is found in Washtenaw Co., Lower Peninsula and in Keweenaw Co. Upper Peninsula and probably occurs throughout the State. *O. A. Farwell.*

WOODSIA ILVENIS (L.) R. Br. Rusty woodsia. Near Norway, Dickinson Co., Upper Peninsula, *C. F. Wheeler.* Common in Upper Peninsula.

WOODSIA ALPINA (Bolton.) Alpine woodsia. Keweenaw Co., Upper Peninsula, *O. A. Farwell.* Apparently rare.

WOODSIA OBTUSA (Spreng.) Blunt-lobed woodsia. Abundant in crevices of overhanging rocks, Lake Huron shore near Port Austin, Huron Co., *C. A. Davis.* Said not to be rare in the Upper Peninsula.

WOODSIA OREGANA (D. C. Eaton.) Oregon Woodsia. South shore of Lake Superior in the Upper Peninsula.

WOODSIA CATHCARTIANA (Robinson). On rock of the lower falls of the Menominee river in the Upper Peninsula, *C. F. Wheeler.* Originally reported as *Woodsia scopulina.*

DICKSONIA PUNCTILOBULA (Michx.) Hay-scented fern. Emmet Co., in Lower Peninsula; Keweenaw Co., in Upper Peninsula, *O. A. Farwell.*

ONOCLEA SENSIBILIS (L.) Sensitive fern. Abundant in damp open or shaded ground throughout the State.

ONOCLEA STRUTHIOPTERIS (L.) Ostrich fern. Abundant on Black river bottom in St. Clair Co.; Lapeer Co.; Huron Co.; Tuscola Co. Occasional throughout the State.

OSMUNDACEAE.

OSMUNDA REGALIS (L.) Royal fern. Flowering fern. Common about marshy places and in swamps throughout the State.

OSMUNDA CLAYTONIANA (L.) Clayton's fern. Common throughout the State in damp open or shaded ground.

OSMUNDA CINNAMOMEA (L.) Cinnamon fern. Common in open or shaded ground, swampy places and on damp shaded banks throughout the State.

OPHIOGLOSSACEAE.

OPHIOGLOSSUM VULGATUM (L.) Adder's tongue. Abundant in meadow-like ground on Harsen's Island, one of the delta islands formed by the mouths of St. Clair river in St. Clair Co. Manistee Co., *F. P. Daniels*; Washtenaw Co.; Ingham Co. Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*. Very probably overlooked in many places.

OPHIOGLOSSUM ENGELMANNI (Prantl.) Engelmann's adder tongue. Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*.

BOTRYCHIUM LUNARIA (L.) Moonwort. Near Harrisville, Alcona Co., Lower Peninsula, *W. J. Beal*; Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*.

BOTRYCHIUM SIMPLEX (E. Hitchcock.) Little grape-fern. Iosco Co. in the Lower Peninsula. Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*. Said to be rare in this State. The form *subcompositum* reported from Keweenaw Co., Upper Peninsula by *O. A. Farwell*.

BOTRYCHIUM LANCEOLATUM (Gml.) Lance-leaved grape-fern. In damp mossy places in the Upper Peninsula, *H. Gillman*. Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*.

BOTRYCHIUM MATRICARIAEFOLIUM (A. Br.) Matricary grape-fern. Keweenaw Co. in the Upper Peninsula, *O. A. Farwell*. The form *neglectum* is the common form in Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

BOTRYCHIUM OBLIQUUM (Muhl.) Ternate grape-fern. In damp open woods and thickets near Port Huron in St. Clair Co.; Genesee Co.; Van Buren Co., *Bailey*; Washtenaw Co.; Gratiot Co.; Wayne Co., *O. A. Farwell*. Also in Keweenaw Co., Upper Peninsula, *O. A. Farwell*. The forms *Matricariae*, and *rutafolium* are reported from Keweenaw Co., Upper Peninsula by *Farwell*.

BOTRYCHIUM OBLIQUUM DISSECTUM (Spreng.) Ternate grape-fern. St. Clair Co., but rare, *J. W. Stacy*; Van Buren Co., near Detroit, Wayne Co., *A. F. Foerste*; Gratiot Co., *C. A. Davis*.

BOTRYCHIUM TERNATUM INTERMEDIUM (D. C. Eaton) Ternate grape-fern. Keweenaw Co., Upper Peninsula, *O. A. Farwell*. Charity Island, Saginaw Bay, *Dodge*. Oakland Co., Lower Peninsula, but rare, *O. A. Farwell*.

BOTRYCHIUM VIRGINIANUM (L.) Rattlesnake fern. Common in rich woods and thickets throughout the State. The variety *gracile* is reported from Keweenaw Co. by *Farwell*.

EQUISETACEAE.

EQUISETUM ARVENSE (L.) Common horsetail. Common in damp sandy open or shaded ground and on railway embankments throughout the State. The

forms *riparium*, *campestre*, *medium*, *decumbens* and *nemorosum* are common throughout with the type.

EQUISETUM TELMATEIA (Ehrh.) In cold alder thickets, Keweenaw Co. Rare. O. A. Farwell.

EQUISETUM PRATENSE (Ehrh.) Thicket horsetail. Not yet noticed in St. Clair Co. Macomb Co.; Genesee Co.; Emmet Co. in Lower Peninsula. Keweenaw Co., Upper Peninsula, O. A. Farwell.

EQUISETUM SYLVATICUM (L.) Wood horsetail. Very common in St. Clair Co.; Washtenaw Co., rare; Clinton Co.; Montcalm Co.; Genesee Co., frequent north and west throughout the State.

EQUISETUM PALUSTRE (L.) Marsh horsetail. Said to be about Lake Huron and in the Upper Peninsula.

EQUISETUM LITTORALE (Kuhlewein.) Shore horsetail. Near New Buffalo, Berrien Co.; Iosco Co., in Lower Peninsula. Keweenaw Co. in Upper Peninsula, O. A. Farwell.

EQUISETUM FLUVIATILE (L.) Swamp horsetail. Pipes. In muddy places and shallow water throughout the State. The forms *polystachum* and *limosum* are reported with the type.

EQUISETUM LAEVIGATUM (A. Br.) Smooth scouring rush. This species apparently very doubtful. Reported from Manistee Co. by H. P. Daniels. Specimens collected in St. Clair Co., Michigan and Lambton Co., Ontario by the writer, at first receiving this name by the late Prof. C. F. Wheeler and the late A. A. Eaton, were afterward named *E. hyemale intermedium* A. A. Eaton and so distributed to fern students and the herbariums of the United States. It was said that *E. laevigatum* would probably not be found in this state, but that it was abundant farther west.

EQUISETUM HYEMALE (L.) Scouring rush. Common throughout the State on damp river banks and damp shaded ground. The forms *affine* and *robustum*, are reported from St. Clair county and vicinity.

EQUISETUM HYEMALE INTERMEDIUM (A. A. Eaton.) Scouring rush. Quite frequent and often abundant in dry poor ground in St. Clair, Sanilac, Huron, Tuscola, Lapeer and Macomb counties, and the eastern half of the Lower Peninsula so far as yet examined.

EQUISETUM VARIEGATUM (Schleich.) Variegated Equisetum. Common in damp sand about the shores of the Great Lakes and often on borders of marshes. The exact type of this species for this region according to the late A. A. Eaton, was found not far from the Lake Huron shore at Port Franks, Lampton Co., Ontario on the edge of a lagoon or one of the closed mouths of the Aux Sables river. The form *Jesupi* is the common form within 50 to 75 miles of Port Huron in St. Clair county, usually in poor shaded ground. Very probably to be found throughout the State. The form *Nelsoni* is accredited to Michigan by the late A. A. Eaton, but has not been otherwise reported so far as known to the writer.

EQUISETUM SCIRPOIDES (Michx.) Sedge-like equisetum. In shaded ground throughout the State. Too often overlooked.

LYCOPODIACEAE.

LYCOPODIUM SELAGO (L.) Fir club-moss. Keweenaw Co., Upper Peninsula, O. A. Farwell.

LYCOPODIUM LUCIDULUM (Michx.) Shining Club-moss. Frequent in moist woods throughout the State.

LYCOPODIUM LUCIDULUM POROPHILUM (Lloyd and Underw.) Rock club-moss. Reported from Keweenaw Co., Upper Peninsula by *O. A. Farwell*.

LYCOPODIUM INUNDATUM (L.) Bog club-moss. Along Willow river, Huron Co., Lower Peninsula according to the last Michigan Flora; Sugar Island, Chippewa Co., and Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

LYCOPODIUM ANNOTINUM (L.) Stiff club-moss. Occasional in shaded ground, St. Clair Co., and reported as common throughout the State.

LYCOPODIUM ALPINUM (L.) Alpine club-moss. Keweenaw Co., Upper Peninsula, and banks of Montreat river, *O. A. Farwell*.

LYCOPODIUM CLAVATUM (L.) Common club-moss. Frequent in dry woods throughout the State.

LYCOPODIUM CLAVATUM MONOSTACHYON (Grev. and Hook.) Club-moss. Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

LYCOPODIUM OBSCURUM (L.) Ground Pine. Reported in last Michigan Flora as found in moist woods. Common in Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

LYCOPODIUM OBSCURUM DENDROIDEUM (Mich.) Ground pine. Frequent in moist woods and on open hillsides throughout the State.

LYCOPODIUM SABINAEFOLIUM (Willd.) Cedar-like club-moss. Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

LYCOPODIUM COMPLANATUM (L.) Trailing Christmas-green. Frequent in shaded ground throughout the State.

LYCOPODIUM COMPLANATUM FLABELLIFORME (Fernald.) Ground pine. The common form in Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

LYCOPODIUM TRISTACHYUM (Pursh.) Trailing club-moss. Noticed by C. A. Davis on sand dunes near Port Crescent, Huron Co., Lower Peninsula. Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

SELAGINELLACEAE.

SELAGINELLA SELAGINOIDES (L.) Low selaginella. Isle Royale in Lake Superior and Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

SELAGINELLA RUPESTRIS (L.) Rock selaginella. Genesee Co.; Clinton Co., *C. F. Wheeler*; Iosco Co.; Crawford Co.; Clare Co., *W. J. Beal*, in Lower Peninsula. Keweenaw Co., Upper Peninsula, *O. A. Farwell*.

SELAGINELLA APUS (L.) Creeping selaginella. Frequent in St. Clair Co. and in Oakland Co., Lower Peninsula, *O. A. Farwell*. Believed to be quite common throughout the State, but often overlooked.

ISOETACEAE.

ISOETES MACROSPORA (Dur.) Lake quillwort. Abundant in the waters of St. Clair river about Algonac in St. Clair Co., *W. S. Cooper*. St. Mary's river near Sault Ste Marie, Chippewa Co., Upper Peninsula, *T. C. Porter*.

ISOETES ECHINOSPORA BRAUNII (Dur.) Braun's quillwort. Reported as found in the Upper Peninsula.

Port Huron, Mich.

NEPHRODIUM DELTOIDEUM

BY WILLARD N. CLUTE.

When the collector finds his first specimen of *Nephrodium deltoideum* he can hardly believe that he has found a perfect frond. The small green ears that parallel the rachis in the lower half of the frond are so unlike the other pinnae and the break between the two forms is so sudden and emphatic that it seems easier to assume that these stubby pinnae have been stunted as the result of injury by fungi or insects. Further search, however, only results in the discovery of more fronds of exactly the same pattern, and convinces the collector that he has in hand one of the most curious of the wood ferns.

Nephrodium deltoideum is a native of the West Indies where it grows on the wooded foot hills much as our common wood-ferns grow in the forests of the Eastern United States. When only the upper half of the fronds is seen the fern has no special individuality. It is likely to remind the observer of the common marginal shield fern (*Nephrodium marginale*). But once the whole frond is brought into view its very characteristic form makes it a well-marked species and one that even the novice cannot go astray in identifying. Although its allies give some indication of a reduction of the lower pinnae in their fronds there appear to be none in which the departure in this direction is half as strongly emphasized.

Like practically all the ferns in which the chlorophyll-bearing tissue is reduced in the lower half of the frond, the leaves are produced in circles. The reduction in leaf surface is regarded as an adaptation to light conditions since the upper pinnae are likely to shade those below, but the reduction may have been brought

about also by the necessity for economizing space when several fronds grow in a tuft.

Full grown specimens of this fern may reach a height of three feet though the majority are somewhat shorter. The number of ear-like pinnae varies, but the ears are always more numerous than those pinnae that are of the more conventional pattern. The whole frond is rather stiff and leathery as are those of most terrestrial species which grow in the dryish woodlands in the tropics. The particular specimen from which our illustration was made was collected by the writer at Moore Town in the island of Jamaica where it was fairly common in woods and thickets.

THE OSMUNDAS

BY ADELLA PRESCOTT.

The Osmundas on account of their large size are among the most noticeable of our ferns. In their native haunts they have a stateliness and grace that is not exceeded by any of our other species, but those who are tempted by these considerations to remove them for the decoration of their house grounds are likely to be sadly disappointed. While they will live in almost any location they thrive only where there is an abundance of moisture and in the dry soil surrounding most houses make but a dwarfed and stunted growth.

This is especially true of the cinnamon and royal ferns which reach their greatest perfection in swamps or beside sluggish streams; the interrupted fern grows on dryer soil and will develop very well where the others make but a poor showing.

The collector really deserves better success than he is apt to get, for the digging of these deeply rooted

plants is a task not to be lightly undertaken, and when as sometimes happens, the root gives way suddenly seating the strenuous digger unexpectedly on the ground his enthusiasm as well as his clothing is apt to be dampened, for the time being at least.

The cinnamon fern (*Osmunda cinnamomea*) is one of our commonest ferns being found in large quantities in swampy lands throughout the Eastern States. Its stout crosiers are covered thickly with white wool, tiny tufts of which are found at the base of each pinnule of the mature frond though the color has here changed from silvery white to tawny brown. The sterile fronds are once pinnate with deeply lobed pinnules, the pinnules being more pointed than in its relative the interrupted fern. They grow in a circular or vase shaped chump, are from two to six feet in height and a soft light green in color. The fertile fronds look very different, being much shorter, stiff, club-like and cinnamon-brown in color and are very noticeable among the soft greens of early summer. But for all their different appearance these club-like fronds are really the counterparts of the sterile fronds with reduced area and covered with sporangia. When the spores are shed, the fertile spikes wither and soon disappear. The root-stock is large and one end is annually renewed by fresh crowns of fronds while the other gradually dies. If no disaster overtakes the plant it may live to extreme age. It is found from Nova Scotia southward and in the West Indies as well.

The interrupted fern (*Osmunda Claytoniana*) is by no means uncommon in the eastern states, but is often passed by unnoticed because of its resemblance to the cinnamon fern. The first specimens I ever saw were brought from Vermont and I was assured that

it did not grow in this State, but a few weeks later I found a fine specimen by the roadside a few miles away and still later found many vigorous clumps in an old pasture beside an old wall and around piles of stone. In spite of its resemblance to the cinnamon fern there are many little points of difference and when they are in fruit there is no mistaking them. Generally speaking it is a little more slender and delicate in appearance than the cinnamon fern. The crosiers are not so woolly and they lack the tiny tuft at the base of the pinnules but the habit of growth is similar in both species. The fertile fronds are taller than the sterile and both are oblong lanceolate in shape with pinnatifid, blunt-lobed pinnae. The spore bearing organs are near the middle of the frond and are very like the fruiting pinnae of the cinnamon fern, but seem such an out of place "interruption" of the green frond that they are often taken for dwarfed and blighted pinnae rather than the reason for being of the fern. The fertile part early withers and falls leaving a bare space on the rachis which emphasizes the common name.

The flowering fern (*Osmunda regalis*)—for whatever the hair-splitting among botanists the beauty of our fern makes it truly royal—is common both in Europe and America, though it is so unlike most of our ferns in appearance that I fancy many pass it unthinkingly. The first one that I saw was a stunted specimen growing beside a house a forlorn plant with no suggestion of royal lineage. But I learned the look of it and when later I saw beside the road a lusty plant six feet or more in height and nearly as much in diameter, I knew it at once, though the abundant supply of water had so greatly increased its size. The large twice pinnate fronds are a beautiful cool, green

with a dark shining rachis gleaming through the green pinnae. The blade is divided into several pairs of opposite branches, each of which has six or more pairs of slightly stalked oblong pinnules with finely toothed margins. Fertile and sterile fronds are alike except that in the fertile fronds the upper pinnae are changed into spore-bearing organs after the manner of the interrupted fern and like that relative shows many irregularities of form, obtusilobata forms being not uncommon. It is found very commonly in the Eastern States and in some parts of the Northwest. It may be looked for in half-shaded swamps and if cultivated must have an abundance of water if it is to achieve the grace and distinction associated in our minds with royalty.

New Hartford, N. Y.

RARE FORMS OF FERNWORTS--XXI.

ANOTHER FORM OF THE CHRISTMAS FERN.

Given a species common enough and the varieties or forms of it that may be found will depend a good deal upon the energy and persistence of the one making the search. Even without special search odd forms occasionally turn up and this is the case with the one under discussion for which the name *lanccolatum* is proposed. It was found at Fairfield, Conn., by E. H. Eames nearly ten years ago. Several specimens were collected but a subsequent trip for more failed to locate the specimens if indeed, they had not reverted to the type.

The form *lanccolatum* is characterized by the lack of the ear-like pinnule at the base of each pinna and is the only form thus far reported which makes this departure from the normal. Toward the base of each pinna

the margin breaks up into small toothed lobes and there are indications that very little inducement would be needed to make it pinnatifid. The most singular feature of the plant, however, is found in three veins of almost equal prominence that extend through each



Pinnae of *Polystichum acrostichoides lanceolatum*.

pinna. We illustrate the three lowest pinnae from a frond kindly loaned by Mr. W. A. Poyser. The curious lanceolate three veined pinnae persist throughout the frond the only difference apparent is the natural decrease in size as the tip is approached. The specimen was found in rich soil in old woods where the type grew abundantly.

ADDITIONS TO THE FERN FLORA OF INDIANA

BY E. J. HILL.

The following is a list of additions to the Fern Flora of Indiana which I made on looking over the list in October *Fern Bulletin*.

Ophioglossum vulgatum. I have found this twice in Lake county at the north end of Wolf Lake and a mile or so northwest of Miller. It was in 1897 and 1898.

Nephrodium Goldicanum. In woods, Otis, La Porte county.

Nephrodium spinulosum dilatatum. Dune Park, Porter county.

Selaginella rupestris. Dune Park, Porter county.

Sclaginella apus. South side of Deep River, New Chicago, Lake county.

Azolla caroliniana. Stark county, in coves or quiet waters of Kankakee river. South end of English Lake, at the crossing of the Erie railroad about four miles west. Was collected in abundance in 1894.

Chicago, Ill.

PTERIDOGRAPHIA

NEW PANAMA CLUB MOSSES.—In "Smithsonian Miscellaneous Collections" volume 56, number 29, W. R. Maxon has described and illustrated three new club mosses from Panama. A single glance at the illustrations shows that these are club-mosses by courtesy only, that is, they do not belong to that group of *Lycopodiums* that bear their sporangia in club-like spikes, but are instead more nearly allied to species like *Lycopodium lucidulum* in which the sporangia are borne in axils of leaves that are otherwise much like those devoted to vegetative functions. A considerable number of tropical *Lycopodiums* are of this type, but unlike more northern species they grow on the trunks and branches of trees instead of on the ground. The most interesting of the recently described species is *L. stamineum* which has leaves scarcely wider than threads.

FILMY FERNS IN DRY REGIONS.—The Hymenophyllaceae or filmy fern family received both its scientific and common names on account of the diaphanous fronds of the various species which in most cases are only a single cell thick and entirely devoid of the water proof epidermis that protects other ferns from evaporation. As a result of such structure, the filmy ferns rarely grow to any considerable size, and in general

are restricted to damp and shady places such as ravines and forests. They are commonly found growing on the trunks of trees, rocks and the like and in many ways remind one of the mosses with which they are usually associated. In view of these conditions, therefore, it is somewhat surprising to learn that some filmy ferns, like a few mosses, are able to live in regions where the supply of moisture is extremely limited. One of these is the round-leaved filmy fern (*Trichomanes reniforme*) which in New Zealand has been found growing plentifully upon dry lava rock. Another species *Hymenophyllum sanguinolentum*, which grows with it is usually found in dryish woods, but the round-leaved filmy grows elsewhere in the wettest forests. In the exposed situations on lava rock the fern avoids some evaporation by rolling its fronds, but this cannot prevent almost complete drying out. Possibly it has something of the moss constitution which on occasion can endure almost complete dessication. *Trichomanes reniforme* is remarkable among filmy ferns for having fronds that are four cells thick.

THE BRACKEN AS A WEED.—Those who have occasion to cross the half wild pastures and bushy fields are familiar with the dense growth of bracken that is now and then encountered, but one rarely thinks of it as a noxious weed. In other parts of the world, however, it is less retiring. In British Columbia it is reported as being often higher than a man's head, and in the Southern Hemisphere a closely allied species or variety, *Pteris esculenta*, not only covers considerable areas with its tall fronds, but appears to be disposed to spread into new territory. L. Cockayne writing of it in *The Plant World* says: "No sooner is the forest destroyed in some localities, the heath burned or the moor drained ever so little, than, as if by magic, the bracken

fern gains possession of the ground. 'Fern,' to the settler, is a specific term and in a land of ferns refers only to the bracken, which he knows to his cost is so difficult to eradicate. When a bracken heath is well developed, it is a trial both to one's patience and muscles to force a path through the entangled mass of fronds, at times more than man high."

ALASKA FERN.—Most of our readers are doubtless familiar with that interesting form of *Polystichum aculeatum* the fronds of which bear numerous tiny plantlets scattered along the rachis. The fern is usually for sale by florists. A subscriber in Seattle, Washington writes that in his city the plant is known as the Alaska fern.

WOODWARDIA ON CAPE COD.—An article in a recent botanical magazine on the flora of Cape Cod reminded the writer of a walk once taken from the end of crescent-shaped Provincetown toward the ocean. The cart-path followed ran through sand, deep sand—typical Cape Cod sand—than which there is nothing more sandy. This was not always unproductive. There were tangled thickets of thorny smilax and along the railroad which it was necessary to cross, beds of shining bear-berry brilliant with fruit. We did not look for ferns; nevertheless we found them, for suddenly the path led through a boggy place, probably the bed of one of those small ponds which are found among the sand dunes back of Provincetown. There were in the damp way a few plants of *Drosera*, *Xyris flexusa*, meadow beauty and *Habenaria blephariglottis* and crowding upon them and each other a mass of up-standing fronds of *Woodwardia Virginica*. It was a very happy occasion for the botanical tramp.—S.

INDEX TO RECENT LITERATURE

Readers are requested to call our attention to any errors in or omission from, this list.

BISSELL, C. H. *A New Locality for Asplenium ebenoides*. American Fern Journal Ja. 1912.—Another Connecticut station.

CLUTE, W. N. *The Male Fern*. illust. Fern Bulletin O. 1911.

CLUTE, W. N. *Rare Forms of Fernworts—XX. The Forms of Ebony Spleenwort*. illust. Fern Bulletin O. 1911.

GREENE, F. C. *The Fern Flora of Indiana*. Map. Fern Bulletin, O. 1911.

MAXON, W. R. *A New Fern from Panama*. American Fern Journal, Ja. 1912.—*Dicranopteris Williamsii* described.

MAXON, W. R. *A New Name for a Hawaiian Fern*. illust. American Fern Journal, Ja. 1912.—*Polypodium Saffordii* suggested in place of *P. minimum*.

PEMBER, F. T. *The Colorado Desert for Ferns*. American Fern Journal, Ja. 1912.

PHELPS, O. R. *A Plea for Fern Protection*. American Fern Journal, Ja. 1912.

RUGG, H. G. *Random Notes on Bermuda Ferns*. American Fern Journal, Ja. 1912.

SAFFORD, W. E. *Notes of a Naturalist Afloat—II*. illust. American Fern Journal, Ja. 1912.—An occasional reference to ferns.

WATERS, C. E. *Evergreen Ferns*. Fern Bulletin, O. 1911.—Reprinted from *Linnaean Fern Bulletin* Vol. 4.

EDITORIAL

Ten years ago, the late Benjamin D. Gilbert, wishing to have a more extended list of references to the fern literature of the preceding decade, than is given in our table of contents, made a very comprehensive index to the first ten volumes of this magazine which was subsequently published by the Linnaean Fern Chapter and is known as "the ten-year Index." Now that the close of another ten year period is fast approaching, some of our readers have suggested that another index of the kind would be desirable. With this opinion we are inclined to agree, but the editorial time is so heavily mortgaged to other things for some time to come that we can scarcely promise it. If anyone among our readers cares to undertake the task we will be glad to render every assistance in our power, supplying extra copies of the magazine and the former index, and when completed publishing the index as the work of the compiler and supplying him extra copies for his own use. There are two ways in which this index may be offered to readers: It may, like the previous index, be offered for sale at 25 cents a copy, or it might be printed as the last number of the 20th volume and sent to members without extra charge. We would be glad of an expression of opinion from our readers on this subject.

* * *

In the recent Annual Report of the American Fern Society, the statement is made that ninety cents out of each dollar paid in by members, is set aside for running the Society's "official organ." Since this particular publication is exactly the same size as The *Fern Bulletin* and is issued the same number of times a year, the extra cost of running it compared with what was formerly paid would seem to be due to inefficiency

somewhere. The Fern Society exists ostensibly to help along the study of ferns, but how the study can be helped much on an income of ten cents a member is a puzzle which we are quite willing to let the officers figure out—it is too much for us. As a matter of fact, the Fern Society has done nothing in the past three or four years to advance the study of ferns or to deserve the support of fern students. There seems to be a lack of any settled policy for advancement and the Society runs along chiefly through the momentum acquired when fern study was younger. Either the “official organ” should get down to business and discuss American ferns and other things of interest to American fern students, or it should ask less assistance from the treasury. A Society that exists only to publish an “official organ” has a serious attack of the dry rot.

* * *

So far as known to us, there are but thirty-one complete sets of this magazine in existence. One fortunate New Yorker has, by the exercise of considerable correspondence, accumulated two sets and the editor also had two up to the present. One of these latter, however, has now gone abroad and will hereafter be held in Berlin. There is but one other complete set owned on the other side of the world. This is in the possession of M. C. Belhatte of Paris. In the past we have had many orders for full sets from foreign correspondents, but of course have been unable to fill them. The set just disposed of was the one used for reference in the office of this magazine but which, in view of the approaching consolidation of the magazine with *American Botanist*, was one that could now be spared. It is probably too late now to hope for further complete sets though several readers of this

magazine have various odd numbers that if combined would possibly make one or more complete sets. If anybody has numbers earlier than volume VI which they are willing to sell we shall be glad to hear from them.

* * *

There is no use trying to stop when one has the habit! We expressly stated in the October issue of this magazine that we desired subscribers to pay only to the end of 1912, but as usual a considerable number of renewals were for a year and a half or two years in advance. We have credited our subscribers with the amounts sent and at the end of the year, when this magazine becomes part of a larger publication, we will either extend subscriptions to the new magazine or refund the money as desired. Therefore: send as much money as you wish in renewing. It will be as safe with us, and as get-at-able as if in a bank.

* * *

Mr. W. N. Steil of the University of Wisconsin located at Madison, Wis., is making a study of apogamy and apospory in ferns and is very anxious to obtain spores of *Pellaea gracilis* and other species of *Pellaea* except *P. atropurpurea*. Since it is spores rather than fertile fronds that are wanted it is possible that some of our readers may be able to accommodate him. Even if the fronds have been promised elsewhere in exchange the spores that may be found in the collecting papers will answer the purpose, though Mr. Steil prefers the fertile fronds. Mr. Steil is willing to pay anyone who is able to secure the desired material for him and we trust that those having access to the species in question will communicate with him.

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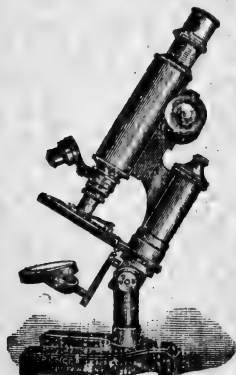
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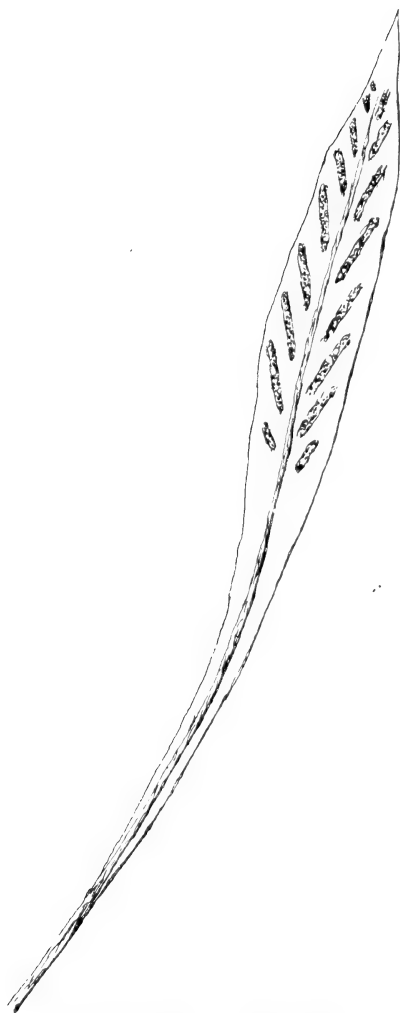
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THE FERN BULLETIN

Vol. XX

APRIL, 1912

No. 2

THE FERN FLORA OF ILLINOIS.

By E. J. HILL.

The state of Illinois has an area of about 55,000 square miles. It lies between the parallels 37° and $42^{\circ} 30'$, thus giving a length of $5\frac{1}{2}^{\circ}$ or about 380 miles. This north and south extension produces a milder climate in the southern part, but no fern of essentially southern distribution comes in except *Polypodium polypodioides*, though the two quill-worts of the state are perhaps better placed under this head also. It is the lowest of the north-central states in average altitude, the mean above sea level being about 600 feet, varying from 300 feet at the junction of the Ohio and Mississippi rivers to 1250 feet at the Wisconsin line in the extreme northwest part. As there is nothing in these extremes of elevation to effect material changes of temperature due to altitude, its floristic features are not much modified in respect of this. Anything of this character must be ascribed to local conditions, not general causes. Another factor that affects its floristic features is the dominance of prairie within its boundry, the forests and woodlands, sometimes very narrow strips, chiefly bordering its streams and lakes. Since lands covered with grass are not adapted to the growth of ferns, and consequently are limited in species, their number and variety must be much restricted for this reason. This must have been the case in the primitive condition of the prairies before they were so generally taken up for cultivation.

The loss in the original fern-flora is slight in this regard when compared with that of flowering plants. As nearly all of the state is in the region of the glacial drift, the soil is influenced by this condition also. The ravines cut in the drift and in the underlying rock where it is reached, with their varying degrees of moisture and shade, show the greatest variety in fern-life, though a greater abundance of certain kinds may be found in woods and swamps. The prevailing rocks are limestone, but sandstones occur in some localities, especially along the Illinois and Rock rivers. These in some parts of the state, particularly in the coal measures, the area of which is large, may be interstratified with shales and slate. These rocks and the soils resulting from their disintegration and decomposition, taken in connection with those of the glacial drift, provide a fair range of edaphic conditions for the growth of ferns. It is evident that such as prefer a calcareous soil will be best represented, if any preference of this kind inheres in their nature.

It will be seen from the list that not quite one half (56) of the Pteridophytes accorded specific rank in "Gray's New Manual of Botany" (115) are reported from this state. The genera are represented in larger proportion, 23 of the 31 given, or if *Athyrium* be separated, 24 of 32, or three-fourths of them. All the species of several of the smaller genera are found, up to three in the case of *Osmunda*, but all of none with species exceeding this number. The genus most fully represented is *Equisetum*, eight of the ten, or nine of eleven when *E. robustum* is given specific rank. To these must be added *E. Ferrissii*, not in the Manual.

Reliable data for the distribution of the ferns of the state are not very full. It is hoped that they may be made more complete by the co-operation of those into

whose hands the list may fall. Many additions to the number of species can hardly be expected. Doubtless the state has been quite well explored in this respect. I find only two to add to those published by Patterson in 1876, *Isoetes Butleri*, described in 1878 from specimens found in Indian Territory (Oklahoma) but since found in this state, and *Equisetum Ferrissii*, a recent addition. The list is mainly a compilation made at the request of the editor of the *Fern Bulletin*. No special fitness for the task is claimed, since my personal knowledge of the region covered is almost wholly confined to five of the northeastern counties, Kankakee, Will, Cook, Dupage and Lake. Only casual trips of slight duration have been made to other places. The publication most relied on for the state at large is the "Catalogue of the Phaenogamous and vascular cryptogamous plants of Illinois," H. N. Patterson, Oquauka, Ill., 1876. His catalogue of plants growing in the immediate vicinity of Oquauka has also been used. Friedrich Brendel's "Flora Peoriana, Budapest, 1882," (the German edition, but since given in English, I believe) has furnished some definite information for a district around the city of Peoria. The floras of H. H. Babcock and of Higley and Raddin for Chicago and vicinity have likewise been consulted, but as they respect territory mainly familiar to the writer, could be cited but little.

As explanatory of the plan followed I may state that I have first mentioned the localities or stations with which I am personally acquainted, and from which examples are in my herbarium unless very common throughout. Citations from Patterson's catalogue for the state at large are entered in quotation marks followed by (P.). Where Peoria is given the authority is Brendel, where Oquauka, Patterson. A few have

been furnished by V. H. Chase, who collected in Stark county and vicinity, and by Prof. Atwell of the Northwestern University, from data in the herbarium of the University.

OPHIOGLOSSACEAE.

OPHIOGLOSSUM VULGATUM (L.) "Wabash county, a single plant." *Schneck.*" (P.) Probably elsewhere, but easily overlooked.

BOTRYCHIUM OBLIQUUM (Muhl.) In open woods, Cook Co., rare. "S. Illinois. *Vasey, Schneck.*" (P.) Peoria Co., *V. H. Chase.* Starved Rock. *J. H. Ferriss.*

BOTRYCHIUM OBLIQUUM DISSECTUM. (Spreng.) Peoria Co., *V. H. Chase.*

BOTRYCHIUM VIRGINIANUM. (L.) Common in rich woods in the northeastern part of the state, and probably throughout. It often occurs in colonies, sometimes of a dozen or more plants. In woods along Lake Michigan it reaches a height of two feet.

OSMUNDACEAE.

OSMUNDA CINNAMOMEA. (L.) Abundant in swampy areas in the northwestern counties, especially in peaty ground near Lake Michigan within the limits of the ancient glacial Lake Chicago. Swampy areas in sand barrens west of Kankakee, "Menard county. *Hall.*" (P.) Starved Rock. *Clute.*

OSMUNDA CLAYTONIANA (L.) Frequent in swamps and wet woods from Kankakee county north in the eastern part of the state. Peoria, *Brendel.* Henderson Co., *Patterson.* "Moist ravines, common," says Patterson for the state at large.

OSMUNDA REGALIS (L.) Has a range similar to the last and is quite frequent northeast in swamps and

wet woods. Peoria, *Brendel*. Mason county, *Bebb*. Infrequent says Patterson for the state as a whole.

POLYPODIACEAE.

ADIANTUM PEDATUM (L.) Common throughout the state in rich woods.

POLYPODIUM VULGARE (L.) On cliffs of sandstone, La Salle and Ogle counties. "Common in Jackson and Union, *French, Forbes*." (P.)

POLYPODIUM POLYPODIOIDES (L.) Common throughout the state in rich woods.

PTERIS AQUILINA (L.) Copses and borders of dry woods. Frequent, or abundant in localities north-east. Starved Rock, LaSalle county, Peoria, *Brendel*, Henderson, *Patterson*, Shelby, *Mary Evertz*. "Common." for the state. (P.) Rare in Will county in the prairie region. *Clute*.

CHEILANTHES LANOSA (Michx.) "Rocks, St. Clair county, *Brendel*, and southward." (P.)

CHILANTHES FEEI (Moore.) Limestone cliffs by Mississippi river, Carroll county, "near Galena, *Brendel*; Pike county, *Mead*; Jackson, *French*." (P.)

PELLAEA ATROPURPUREA (L.) Frequent on cliffs of limestone along the Desplaines river and its tributaries from Sag Bridge, Cook county, to Joliet, Will county, and in Kankakee and Carroll counties. Scarce on cliffs of sandstone, Oregon, Ogle county. Henderson county, *Patterson*; Kane county, *W. J. Minium*; Wedron, LaSalle county, *Ferriss*. Reported for the state as general but "infrequent" in Patterson's catalogue.

PELLAEA GRACILIS (Michx.) Rare in thin soil in shelves of shaded and usually moist calcareous rocks. Sag Bridge and Lemont, Cook county, and Bounbonnais, Kankakee county. On moist sandstone

rocks, Liberty Hill, Oregon, Ogle county : limestone. Aurora, Kane county ; sandstone, Sheridan, LaSalle county, *Ferriss*.

ASPLENIUM ANGUSTIFOLIUM (Michx.) Henderson, *Patterson*, Peoria, *Brendel* "Rich woods, scarce for the state." (P.) Joliet rare, Starved Rock more common, *Ferriss*.

ASPLENIUM PINNATIFIDUM (Nutt.) "On rocks, Jackson and Union counties, *French*; Pope, *Schneck*." (P.)

ASPLENIUM PLATYNEURON (L.) "Open rocky woods, scarce." (P.)

ASPLENIUM EBENOIDES (R. R. Scott.) Reported from Jackson county, Ill., but without further reference in *Fern Bulletin*, vol. V., p. 13.

ASPLENIUM TRICHOMANES (L.) "On shaded rocks, Jackson and Union counties, *French*; Wabash, *Schneck*." (P.) Southern Illinois. *Vasey*. Starved Rock, two plants. *Ferriss*.

ATHYRIUM FILIX-FOEMINA (L.) Frequent in rich, moist woods in Cook and adjoining counties, as well as throughout the state as given by *Patterson*, Peoria, *Brendel*; Jackson, *Saml. Bartley*; Henderson, *Patterson*; Ravinia, Willow Springs, Cook county, *Prince*.

ATHYRIUM THELYPTEROIDES (Michx.) "Near Glen-coe, Cook county," *Higley and Raddin*; "Peoria and Fulton counties, *Brendel* and *Wolff*; Wabash, *Schneck*." (P.) Joliet, rare; Starved Rock abundant, *Ferriss*.

CAMPTOSORUS RHYZOPHYLLUS (L.) On outcrops of limestone in the Desplaines valley in Cook and Will counties from Sag Bridge to Joliet. Abundant at Dellwood Park and in one locality at Sag Bridge.

infrequent elsewhere. "Shaded rocks throughout but scarce." (P.) Jo Daviess county, *Pepoon*.

PHLEGOPTERIS HEXAGONOPTERA (Michx.) "Rich open woods and shaded ravines, chiefly in the northern portion of Cook county; infrequent." *Higley* and *Raddin* (1891.) Peoria, *Brendel*; Henderson, *Patterson*; Jackson, *Bartley*; Joliet and Starved Rock, *Ferriss*. Patterson reports "frequent" throughout.

PHLEGOPTERIS POLYPODIOIDES (Fée.) Starved Rock, La. Salle county, "Menard county, *Hall*." (P.)

NEPHRODIUM NOVEBORACENSE (L.) "Elgin, Kane county, *Vasey*; Wabash, *Schneck*, Swamps, scarce." (P.)

NEPHRODIUM THELYPTERIS (L.) Frequent or often abundant in swampy, wooded ground or open marshes, in Cook, Lake, Dupage, Will and Kankakee counties, Peoria, *Brandel*; Starved Rock, *Clute*. Frequent throughout the state according to Patterson.

NEPHRODIUM CRISTATUM (Michx.) Starved Rock, rare, *Ferriss*.

NEPHRODIUM GOLDIEANUM (Hook.) "Rich Woods, Peoria and Fulton counties, *Brendel*, *Wolff*; Ma-kanda, Jackson county, *Forbes*," (P.) Will county, La Salle county, *Ferriss*.

NEPHRODIUM MARGINALE (L.) Rocky bluffs, Starved Rock, La Salle county, Southern Illinois, *Vasey*. "Scarce" for the state. (P.)

NEPHRODIUM SPINULOSUM INTERMEDIUM (Muhl.) Frequent in rich woods in the northeastern counties, Starved Rock, *Clute*. Patterson says "infrequent" for the state.

POLYSTICHUM ACROSTICHOIDES (Michx.) Will county,

"north part of Cook county," *Higley* and *Raddin*; Henderson, *Patterson*; Peoria, *Brendel*; Jackson, *Bartley*. For the state, "infrequent." (P.) The variety *incisum* is occasionally reported.

CYSTOPTERIS BULBIFERA (L.) Frequent on shelves and in crevices of limestone cliffs and shady ravines in the Desplaines valley in Cook and Will counties, and in Kankakee county, Henderson, *Patterson*, Peoria, *Bredel*; Starved Rock, abundant, *Clute*. Patterson reports for the state, "shaded rocks, frequent."

CYSTOPTERIS FRAGILIS (L.) Rather frequent in rich woods and occasionally on rocks in Cook, Lake, Du-page, Will and Kankakee counties; Henderson, *Patterson*; Peoria, *Brendel*; Jackson, *Bartley*. "Common" for the state. (P.) Very variable in its forms.

WOODSIA OBTUSA (Spreng.) Scarce on limestone rocks at Lemont, Cook county, abundant on sandstone at Oregon, Ogle county, "Marion county, *Bebb*; Wabash, *Schneck*; and southward." (P.) Joliet, Will county, *Ferriss*.

WOODSIA ILVENSIS (L.) "On sandstone cliffs near Oregon, Ogle county, *Bebb*." (P.)

ONOCLEA SENSIBILIS (L.) Common in wet woods and swamps in the northeastern counties. Peoria, *Brendel*; Jackson, *Bartley*. For the state "common." (P.)

ONOCLEA STRUTHIOPTERIS (L.) Wet shades, Starved Rock, La Salle county, Henderson, *Patterson*; Peoria, *Brendel*; Fulton, *Wolff*. For the state "infrequent." (P.)

DICKSONIA PUNCTILOBULA (Michx.) "Wabash county, *Schneck*." (P.)

SALVINIACEAE.

AZOLLA CAROLINIANA (Willd.) "Ponds from Henderson and Peoria counties southward. Infrequent." (P.) "Since 1857 not found again in the region of our local flora." *Brendel* in *Flora Peoriana*. "In a pond near South Chicago, 1886. So far as known this is the only locality where this species has been found within our limits." *Higley* and *Raddin*.

EQUISETACEAE.

EQUISETUM ARVENSE (L.) Common from Kankakee county north. Reported by Patterson as common throughout the state. Though usually growing in moist sand or gravel, it is often found in the Chicago region in masses along dry railway embankments.

EQUISETUM PALUSTRE (L.) "Wet places, Peoria county, *Wolff*, *Brendel*." (P.)

EQUISETUM FLUVIATILE (L.) In shallow water or very wet ground. Quite frequent about Chicago. "Cass county, *Mead*; Peoria, *Brendel*; McHenry, *Vasey*. Scarce." (P.) Joliet, common, *Ferriss*.

EQUISETUM LAEVIGATUM (A. Br.) Cook and Kankakee counties." "In dry or moist clay or sand from Henderson and Peoria counties southward." (P.) In the Chicago region generally in moist sands; Hancock county, *Mead*.

EQUISETUM HYEMALE (L.) Moist places, Cook, Will and Lake counties. Frequent, as well as throughout the state according to Patterson.

EQUISETUM FERRISSII, (Clute.) Moist banks, Will county.

EQUISETUM ROBUSTUM (A. Br.) On moist or wet banks of streams. Thornton and La Grange, Cook

county. "River banks from Peoria county southward." (P.)

EQUISETUM VARIEGATUM (Schleich.) In clayey ravines at Lake Forest and in wet sands at Waukegan, Lake county, Peoria, *Brendel*. Var. *Jesupi*, A. A. Eaton, and var. *Nelsoni*, A. A. Eaton, are credited to Illinois in Gray's New Manual of Botany. The latter variety occurs in Lake county, Ind., bordering Illinois, and is likely to be found in the neighboring parts of this state, but those from Lake county, Ill., agree better with the typical form.

EQUISETUM SCIRPOIDES (Michx.) Moist shaded ravines, Lake Bluff, Lake county. Reported by *Cowles* at Lake Forest. "Ringwood, McHenry county, *Vasey*." (P.)

LYCOPODIACEAE.

LYCOPODIUM INUNDATUM (L.) "Moist sands, south Evanston, Cook county." *Higley* and *Raddin*.

LYCOPODIUM LUCIDULUM (Michx.) "Moist woods, Evanston, Cook county, *Vasey*; Ogle, *Bebb*." (P.)

LYCOPODIUM SELAGO (L.) "Collected by J. W. Powell near Ottawa, *Vasey*." (P.)

SALAGINELLACEAE.

SELAGINELLA RUPESTRIS (L.) Dry sands and sandstone rocks, La Salle and Ogle counties. "Dry rocks and barrens, Henderson county; Ogle. *Bebb*, Rare, or overlooked." (P.)

SELAGINELLA APUS (L.) Low sandy, peaty, or springy ground, Kankakee, Cook, Lake and Will counties. Peoria, *Brandel*; Lawns in Joliet, *Miss. L. M. Hird*. "Low sandy places," says Patterson, as if throughout the state.

ISOETACEAE.

ISOETES MELANOPODA (J. Gay.) "Muddy borders of a pond near Hyde Park water-works, 1885. Wet prairies near Grand Crossing, 1886-87." *Higley and Raddin*. These stations in Cook county are doubtless destroyed now. Stark county, *V. H. Chase*. "Menard, *Hall*; Fulton, *Wolff*; McHenry, *Vasey*." (P.)

ISOETES BUTLERI (Engelm.) "Moist hillsides and shallow depressions, Illinois and Kansas to Tennessee and Oklahoma." Gray's New Manual of Botany.

A PROBLEMATICAL FERN.

(*Gymnogramma lanceolata*.)

BY WILLARD N. CLUTE.

In the identification of fern species one occasionally comes upon two forms so nearly alike that it requires very careful study to decide whether they are two different species or merely two forms of a single variable species, but it is rare that one finds a fern that can as well be placed in one genus as another, and still more rare when the species possesses characters so like those of ferns in other groups that it may be moved from one tribe to another without violating any of the botanical properties. The fern chosen for illustration here is one of this latter character. It has been passed back and forth between various genera in different tribes, seldom resting long in one place, until it is a very problematical species indeed.

In outline and manner of growth it possesses no especial peculiarities. The lanceolate leaves might fit any of a dozen or more species that might be mistaken for it if the fruit dots or sori were absent. *Vittaria*, *Tae-*

mitis, *Antrophyum*, *Polypodium*, *Asplenium*, *Acrostichum* and many other genera have species with leaf outlines that almost exactly match it, but a glance at the fruiting fronds, at once excludes many of these genera as possible harbors for the species and at the same time increases the difficulties of finally placing it. The sori are apparently linear and *Scolopendrium* or *Asplenium* comes to mind, but there is no indusium and so the relationship is thrown into that group of ferns clustering about such forms as *Gymnogramma*.

In fact, our fern was for a long time known as *Gymnogramma lanceolata* and owing to this fact I have selected this to stand as the name of the plant. A glance at the illustration, however, will disclose a frond not at all like the conventional *Gymnogramma* frond, but it is as much like a *Gymnogramma* as it is like the family to which the plant is now assigned. Curious as it may seem this plant with elongated sori oblique to the midrib is now regarded as a *Polypodium*! Before its settling down in this genus, it had been placed in *Antrophyum*, *Grammitis*, *Loxogramme* and *Selliguea* as well as *Gymnogramma*. This is by no means due to the variable nature of the fern. Through all these vicissitudes it has remained unchanged. The fluctuations from one genus to another even from one tribe to a different one, have been due to the varying opinions of mere man and his efforts to fit the fern to a set of descriptions of his own making. Circumstances such as these are quite sufficient to justify the refusal to accept off-hand the results of every "revision" which ambitious systematists see fit to inflict upon us.

While reposing in the genus *Gymnogramma*, the fern was well-known to be somewhat unorthodox. In every large assemblage of species there are, in ad-

dition to those which are typical, certain others that diverge somewhat, but not enough to form a separate genus. Thus our plant was placed in the section *Selligoea*. Sometimes, indeed, *Selligoea* was isolated as a separate genus, but usually accompanied by the statement that if it were not for the shape of the sorus it would make a good addition to the section *Phymatodes* of *Polypodium*. Here, at least, is where it has landed, the elongated sori being winked at, possibly, or perhaps the species makers are willing to assume each so-called sorus to be a series of *Polypodium* sori. In this age, however, there are those who deny to the species in the group *Phymatodes* the right to be included in *Polypodium* and in certain books our species appears as *Phymatodes loxogramma*. Just how this *loxogramme* came to supplant *lanccolata* is another story, not to be detailed here. Suffice to say that the new name was picked up during one of the fern's numerous transfers.

As to *Phymatodes*, it is likely that the species in this group are distinct enough to form a genus by themselves but it would be a rash student to encourage such a departure, for once started we should soon see all the large genera cut up into lesser groups and then what delightful times the name-tinker would have!

By what ever name called, the species manages to thrive over a wide stretch of country in the Eastern Hemisphere, being found from Japan and China to the Himalyas, Ceylon and the Guinea Coast and represented in many of the islands of the Pacific including Fiji and Samoa. The specimen from which the illustration was made was collected by K. Miyake near Kyoto, Japan where it is reported "not so common."

THE TALL SPLEENWORTS.

BY ADELLA PRESCOTT.

Some years ago when for me there were but two species of ferns, those that were finely cut and those that were not—and maidenhair—I supposed of course that the narrow leaved spleenwort (*Asplenium angustifolium*) was simply a hardy sword fern and that both were varieties of the Christmas fern! But when I began to read the fascinating pages of Clute and Parsons and Waters I found, even in the early summer, that there were differences and by the time the sori appeared I was wise enough to recognize the characteristic mark of the spleenworts. Even then I thought it but a common fern for in the woods with which I was most familiar it grew plentifully and it was not till sometime later that I learned that it is at least rare enough to insure for itself a welcome whenever found.

It is an extremely local plant and may be looked for perhaps for years before being found though it has a wide distribution and is apt to be plentiful where it grows at all. It prefers rather moist soil and seems to like Goldie's fern for a neighbor as I have often found them in close proximity.

The fronds grow in tufts from a creeping root-stock and are said to reach a height of four feet but all that I have seen were shorter by at least a foot. The blades are simply pinnate with many long, narrow pinnules tapering to slender tips. The fertile fronds are taller with the pinnules much narrower and the linear sori borne in two rows along the midrib of each pinnule. The fronds are delicate in texture and are easily destroyed by summer storms, yet the plant is able to adapt itself in some degree to its environment for a plant that I have in a border where it is exposed to cold winds has become much more rugged both in

appearance and in fact. It is a charming addition to the fern garden making a pleasing foil to *Nephrodium spinulosum*, *Dicksonia* and other finely cut varieties.

I think it is a pity that the silvery spleenwort has no common name but one that is suggestive of a varied assortment of "blues," and that does not certainly belong to it at that. But when we consider the discomforts suggested by the word "spleeny" we may think after all that this plain unassuming plant would prefer to be classed among the spleenworts with their fabled powers of healing rather than among the gentle folk of the *Athyriums* where perhaps it rightly belongs.

The silvery spleenwort, *Asplenium thelypteroides*, or *Athyrium thelypteroides* as some prefer to call it, has few characteristics that would make it noticeable among other species. It is of an ordinary size, from two to three feet in height, and the fronds are produced singly from a stout creeping rootstock but they grow so close together as to suggest a circular crown. They are once pinnate with deeply lobed pinnules and have rather a soft velvety texture though quite thin and delicate. The blade is oblong, tapering both ways from the middle and there is little difference between the fertile and sterile fronds.

The sori are borne in regular double rows on the pinnules and while in general they are like those of the spleenwort yet they are frequently curved after the fashion of the lady fern, making a puzzling question on which the botanical doctors fail to agree.

This species is fairly common over a wide area and while not possessing any striking beauty is interesting and attractive to the true lover of ferns.

New Hartford, N. Y.

FURTHER NOTES ON VARIATION IN BOTRYCHIUM RAMOSUM.

BY RAYNAL DODGE.

On June 2nd of the present year I again visited the *Botrychium* stations at Horse Hill, Kensington, N. H., and at Newfound Hill in Hampton Falls. A description of these was given in *The Fern Bulletin* April 1910. I found that a great change had taken place since my last visit in 1907. The young trees had grown wonderfully and shaded the station, the farm house had been abandoned, the hens had disappeared, and *Botrychium ramosum* had again taken its place at the foot of the hill. But instead of the many thousands which formerly grew there, I only succeeded in finding about forty plants, some of them however, quite robust and well grown. On the same day, in company with a friend, I made a thorough search for *Botrychium simplex* at Newfound Hill but failed to find a single plant.

It appears that all the forms in the genus *Botrychium* increase in numbers very slowly and that the individual plants require many years to attain their full development, but if the station for *Botrychium ramosum* on Horse Hill escapes damage by fire or marauding hens I think that within twenty years someone perhaps now younger than I, may find a large colony of *Botrychium simplex* at the old station on Newfound Hill. Several of my young friends have undertaken if possible to make a search.

Perhaps some of the readers of *The Fern Bulletin* know of localities where *Botrychium ramosum* and *B. simplex* are to be found growing near each other. If any such are known it seems that further investigations relating to this subject might be made. Or perhaps it would be enlightening of spores of *B. ramosum*

in sufficient quantity were to be sown on some dry hillside that was easily accessible to the experimenter. Immediate results however should not be expected as these *Botrychiums* move very slowly, according to some experimenters requiring several years before germination of the spores. Moreover in the present case the continued growth of the young plants would be very much dependent on the amount of moisture they might receive as is evidenced by the total destruction of the plants at Newfound Hill by a very severe drouth.

Since speaking on this subject before the members of the American Fern Society I have been informed of two other instances besides those at that time mentioned where plants of *B. simplex* once found had disappeared which seems further evidence that the form *simplex* in *Botrychium* described by Hitchcock as growing in dry hills is not self-perpetuating.

Newburyport, Mass.

[To the instances of the disappearance of *B. simplex*, may now be added the disappearance of the colony found at Glen Park, Indiana in 1910. In that year there was perhaps a hundred plants found. Every year since, members of the Joliet Botanical Club and others have searched for them but not a single specimen has been discovered. Some *Botrychiums* have the habit of resting for a year or more, but it hardly seems likely that they would rest for three summers in succession.—Ed.]

RARE FORMS OF FERNWORTS—XXII.

STILL ANOTHER CHRISTMAS FERN.

In 1893, the late James A. Graves found a curious form of Christmas fern (*Polystichum acrostichoides*) in the vicinity of Susquehanna, Pa., and removed it

to his garden where it continued to put forth its abnormal fronds for many years and may still be alive for anything the writer knows to the contrary. During the period in which Mr. Graves gave his principal attention to the study of ferns he was often advised to describe his abnormal specimen, but he was always so much engrossed in the study and cultivation of the living ferns that he never found time to write a formal scientific description of the plant, though he had settled on a name for it. The form undoubtedly deserves a distinctive name and since the discoverer is no longer with us, it seems very fitting that the form be named for him. I therefore offer the following description of

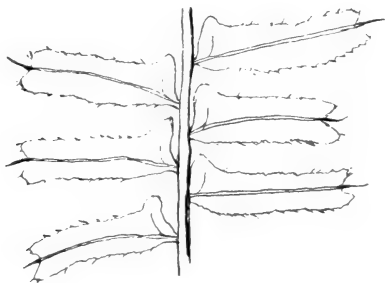
POLYSTICHUM ACROSTICHOIDES f. *GRAVESII*.

Plant similar to the type but with the pinnae ending in truncate tips from which the midveins project as spinelike bristles. Type in the herbarium of Willard N. Clute. Cotype in the herbarium of Alfred Twinning, Scranton, Pa.

Although the description is drawn from a single plant it is likely that a search in the regions where the Christmas fern is abundant would reveal other specimens with the same peculiarity. Indeed, H. G. Rugg in a paper before the Vermont Botanical Club, last winter, described a plant that, to judge from his remarks must be essentially the same thing. He says: "For several years I have had a peculiar form of this fern growing in my garden. It is interesting because of the truncate form of the pinnae and the multifid form of the tip of the frond. The sterile fronds are usually like those of the type plant. This fern I transplanted into my garden several years ago and ever since then it has continued to bear these peculiar fronds. The late Mr. B. D. Gilbert was interested in

the plant and asked permission to describe it in the *Fern Bulletin* but illness and finally death prevented." Apparently the only difference between the Vermont and Pennsylvania plants is the cristate apex, but as forking tips are to be expected in any species this feature is not extraordinary.

Mr. Graves usually spoke of his specimen as the variety *truncatum*. This is the name it bears in some herbaria and is the one it undoubtedly would have borne in literature had he lived to describe it. Those who were fortunate enough to have known Mr. Graves personally, however, will be pleased to see his name



associated with one of the forms of that division of the plant world which he studied so long and so assiduously. It need hardly be said for the readers of this magazine that Mr. Graves was one of the founders of the Linnaean Fern Chapter the name by which the American Fern Society was originally known, was elected the first treasurer and held that office through half the lifetime of the society, was one time president of the same society and for a long time one of the most resourceful of its Advisory Council members.

The drawing herewith was made from the middle pinnae of a frond kindly supplied by Mr. Alfred

Twining, of Scranton, Pa. It is a fair average of the form and though without much beauty of outline is still of interest for the form in which nature has cast it.

NOTES ON VARIOUS FERNS.

BY S. FRED PRINCE.

I was very much interested in Mr. Hill's article on the cliff brakes in the January Bulletin. I lived at Madison, Wisconsin, from 1874 to 1878, and have gathered *Pellaea atropurpurea* many times from the sandstone cliffs, not only on Lake Mendota, but also Lake Monona and outcrops in other parts of the "Four-lake County."

I found it growing on both the Potsdam and the Madison sandstones. On the former it was only in small clumps, or isolated plants, much more sparse in growth than when on the latter, though I never found it anywhere in such dense, tangled masses as it forms in the clefts of the limestone rocks of the southwest Ozarks.

I have also found *Pellaea atropurpurea* growing thinly, on a dark red sandstone, at Paris Springs, Missouri, not far from Springfield.

I would like to add to the localities of *Polypodium vulgare* in Michigan. I found it, in the summer of 1910, growing in dense mats on sand dunes, south of Macatawa, Michigan. The plants were in a woodland composed principally of hemlock, with oak and a general mixture of elm, maple, hickory, etc. When you lifted a mat of the fern, the bare sand was left exposed. I thought the conditions rather peculiar.

I found many ferns growing on these wooded sand hills where, at the most, there was but half an inch of soil on top of the white sand. The list includes:

Adiantum pedatum; *Pteris aquilina*; *Asplenium filix-foemina*, in marshy places between the dunes; *Polystichum acrostichoides*, very sparingly; *Nephrodium thelypteris*, very luxuriant, like the lady fern, in marshy ground; *Nephrodium marginale*, the most common fern; *Nephrodium cristatum*; *Nephrodium spinulosum*, wherever there was a rotting chunk of wood; *Onoclea sensibilis*, and *Onoclea struthiopteris*, both very rank; *Osmunda regalis* and *Osmunda cinnamomea*, these last four in marshy spots; and *Botrychium virginianum*, on the sides of the dunes.

I have been observing the habits of *Onoclea sensibilis* for many years, even raising plants from the spores to five years old; caring for other plants for years, changing conditions, and varying my experiments, until I have come to the following conclusions:

When the soil is constantly and evenly moist and unusually rich, and the plant is constantly shaded, it tends to produce its fertile fronds flattened out like the sterile, with all stages to those only partly rolled up. These *unrolled* fertile fronds do not differ from the *rolled up* ones, on the same plant, except in this one particular.

When a heavy screen was changed so that the plants would be in the full light and sun, the fertile fronds produced the rest of the season were as tightly rolled as usual, and it took two years of shading before these plants produced open or unrolled fertile fronds again. Varying the other conditions—moisture and nutriment, had similar results, but less marked.

Champaign, Ill.

SCHIZAEA PUSILLA AT HOME.

Anyone who has seen this odd fern growing in its native haunts will probably concur in the opinion held by some, that while it is looked upon as one of the rarest of ferns its small size and its habit of growing in the midst of other low plants have no doubt caused it to be passed over by collectors in many regions where it really exists. This should be an encouragement to collectors to keep the fern in mind in their field excursions with a view to adding new stations for it to those now known. The finding of a rare plant in a new locality is always a source of especial pleasure to the discoverer, aside from being an item of value to the botanist in general.

Schizaea pusilla was first collected early in this century at Quaker Bridge, N. J. about thirty-five miles east of Philadelphia. The spot is a desolate looking place in the wildest of the "pine barrens" where a branch of the Atsion river flows through marshy lowlands and cedar swamps. Here amid sedge grasses, mosses, *Lycopodiums*, *Droseras* and wild cranberry vines the little treasure has been collected. But though I have hunted for it more than once my eyes have never been sharp enough to detect its fronds in this locality.

In October of last year, however, a good friend guided me to another place in New Jersey where he knew it to be growing and there we found it. It was a small open spot in the pine barrens, low and damp. In the white sand grew patches of low grasses, mosses, *Lycopodium Carolinianum*, *L. inundatum* and *Pyxidanthra barbata*, besides several small ericaceous plants and some larger shrubs, such as scrub oaks, sumacs etc. Close by was a little stream and just beyond that a bog. Although we knew that *Schizaea* grew within a few feet of the path in which we stood, it required the

closest kind of a search, with eyes at the level of our knees before a specimen was detected. The sterile fronds, curled like corkscrews, grew in little tufts and were more readily visible than the fertile spikes which were less numerous and together with the slender stipes were of a brown color hardly distinguishable from the capsules of the mosses and the maturing stems of the grasses which grew all about. Lying flat upon the earth with face within a few inches of the ground was found the most satisfactory plan of search. Down there all the individual plants looked bigger and a side-long glance brought the fertile clusters more prominently into view. When the sight got accustomed to the miniature jungle, quite a number of specimens were found but the fern could hardly be said to be plentiful and all that we gathered were within a radius of a couple of yards.

This seems, indeed to be one of the plants whose whereabouts are oftenest revealed by what we are wont to term a "happy accident" as for instance, when we are lying stretched on the ground, resting, or as we stoop, at lunch, to crack an egg on the toe of our shoe. I know of one excellent collector who spent a whole day looking for it diligently in what he thought to be a likely spot but without success when finally, just before the time for return came, as he was half crouching on the ground, scarcely thinking now of *Schizaca*, its fronds suddenly flashed upon his sight, right at his feet.

The sterile fronds of *Schizaca pusilla* are evergreen so the collector may perhaps best detect it in winter selecting days for his search when the ground is pretty clear of snow. The surrounding vegetation being at that time dead the little corkscrew-like fronds stand out more prominently. The fertile fronds die before

winter sets in but their brown stalks frequently nevertheless remain standing long after.—*C. F. Saunders in Linnæan Fern Bulletin, Vol. 4.*

PTERIDOGRAPHIA.

A NEW FERN PEST.—According to the *British Fern Gazette* a new pest threatens the specimens of those who collect living plants. This is the larva of a small weevil which gets into the stipes of the ferns and burrowing downward into the heart of the rhizomes soon cause the death of the plant. The weevil is of Australian origin, probably introduced into Britain with imported plants. Its scientific cognomen is *Syagrius intrudens*. At first its depredations were confined to ferns under glass, but more recently it has taken to the ferns in the wild state. This, however, is not the only enemy of the ferns that British growers have to contend with. Another small beetle known as the vine weevil (*Otiorhynchus sulcatus*) is fond of the plants both in the adult and larval stages, but the newcomer has already developed a reputation for destructiveness that places it first as a fern pest.

WALKING FERN AND LIME.—Nearly everybody who cultivates the walking fern (*Camptosorus rhizophyllus*), thinks it necessary to supply it with a quantity of old mortar, quick-lime or pieces of limestone under the impression that the fern cannot live, or at least cannot thrive without a considerable amount of calcium in the soil. As a matter of fact it has been reported on sandstone, shale, gneiss and granite and may possibly grow on others. Its noticed preference for limestone is apparently not due to its dependence on calcium but rather to the fact that it is more nearly adjusted to the plant covering of lime-

stone rocks than it is to others. It will grow in any good garden soil, but in such situations it must be protected from its enemies, the ordinary weeds of cultivation, which otherwise would soon run it out. The same thing is true of many plants besides ferns. The cactus plant that cheerfully endures the intense insolation and frequent drouth of the sand barrens, succumbs very soon to the grass and weeds when planted in rich soil.

STIPE OR STIPES.—When it comes to the designation of the stalk of a fern leaf, there is a wide difference in the way British and Americans regard it. Americans invariably speak of a single stalk as a stipe and they may be somewhat astonished, upon referring to a dictionary, to find that while stipe is given as a legitimate word, it comes direct from the latin *Stipes* which the Britons, with perhaps a more classical education, are accustomed to use. In America the plural of stipes is stipes or, rather, the plural of stipe is stipes; but in England the plural of both stipe and stipes is *stipites*. In certain uncultivated parts of our own country the singular form of the word species is given as specie; but when we smile at some countryman's description of a specie of fern, our merriment may be somewhat tempered by the thought that we still say stipe instead of stipes. If we could only believe that we use stipe with full knowledge of its derivation, it would not seem so bad, but it is very evidently a case of plain ignorance.

APOGAMY IN PELLAEA.—Apogamy, or the production of a new sporophyte from the gametophyte without the union of egg and sperm, used to be considered a rather rare phenomenon, but as more study is given the matter, it begins to seem fairly common. Several years ago Woronin reported apogamy in *Pellaea*

flavens, *P. niveus* and *P. tenera* and still more recently W. N. Steil of the University of Wisconsin reported the same condition in our native *Pellaea atropurpurea*. In Steil's specimens the young sporophytes were borne on the prothallus lobes near the notch. The same investigator is now working on apogamy in other species. A note in a recent number of this magazine asked for spores of *Pellaea gracilis* (*Cryptogramma Stelleri*) for this purpose.

LYCOPodium LUCIDULUM POROPHYLLUM.—In the *Ohio Naturalist* for April Prof. J. H. Schaffner devotes several pages to a discussion of the specific distinctness of forms allied to *Lycopodium lucidulum* and comes to the conclusion that *Lycopodium porophyllum* is a good species. If one is to judge by appearances alone, there can be no question as to *L. lucidulum* being different from *L. porophyllum* but if the different appearances that plants put on under different conditions of warmth, light and moisture are to be considered then there as a number of fern species in this country in need of a name. Compare *Woodsia obtusa* grown on a sunny cliff with the same species grown on a moist one, or *Equisetum arvense* in woods and on railway banks. Nobody at present can say positively whether the form called *porophyllum* is a species or not. If it can be grown in moisture and shade while still retaining its characters, or if its spores will produce plants like the parent when sown in moist shades, then the case should be considered closed. Meanwhile, if one were to imagine a dry ground form of *L. lucidulum* what kind of a plant would he construct? Perhaps prostrate stem shorter; branches in a denser tuft, shorter; leaves less notched, smaller; whole plant yellower. Well, that is the description of *L. porophyllum*!

AFFINITIES OF TAENITIS.—The genus *Taenitis* is one that has always puzzled botanists. It was once placed in the tribe Grammitideae along with such genera as *Notholaena*, *Brainera*, *Meniscum*, *Vittaria*, *Hemionitis* and *Drymoglossum*, and it has also been considered sufficiently distinct to stand as the type of a tribe named for it, while recently it has been considered as a member of the tribe *Polypodiaceae*. Now comes E. B. Copeland in the *Philippine Journal of Science* and gives the genus another turn and this time places it in the Davalliaceae largely upon the relationship shown by the internal structure of the stem and the character of the scaly covering. It is likely that the new manipulator of the genus is as near right as anybody. The main thing is to discover what are the real indications of relationships. With some students it is venation, with others the shape and position of the indusium, with others the character of the vestiture and still others may have other rules by which to judge. When we agree upon the proper earmarks, anybody ought to be able to put the ferns in their proper groups.

SPOROPHYLL ZONES.—The fact is well known that some of the club-mosses, notably the shining club moss (*Lycopodium lucidulum*) and the fir club-moss (*L. Selago*), bear their sporangia in bands or zones that alternate with regions on the stem in which there are no sporophylls, but it does not seem to be equally well recognized that the same phenomena are found pretty generally among the ferns. If one will examine the crowns of the cinnamon fern, it will be readily seen that sporophylls and vegetative leaves form alternating circles. Curiously enough, the fertile fronds, which appear at maturity within the circle of sterile leaves, re-

ally belong to the outer circle, as befits the group that is to develop first. The sensitive and ostrich ferns are other species in which the zones of fronds are very distinct. So pronounced is this, and so far has each kind developed before unfolding, that each is usually incapable of taking up the functions of the other in cases where the destruction of one kind makes such exchange necessary or desirable. From efforts on the part of the plant to supply vegetative tissue to leaves designed originally for spore-bearing, only, we owe the various "obtusilobata" forms occasionally reported. The differences in zonation here mentioned are most pronounced in ferns with dimorphic fronds, but evidences of the same thing, more or less distinct may be found even in those ferns that have the fertile and sterile fronds essentially alike in outline. As a usual thing, the spore-bearing leaves are produced after the vegetative leaves have unfolded and when we find a plant in full fruit in late summer, that lacked spores in spring, it is due to the developing of the fertile leaves later. This is especially true and most noticeable in ferns that produce their fronds in crowns, but even in those species with running rootstocks, we commonly find evidences of zonation. Following out the idea of zonation we find among many of the fern allies that not only are the sporophylls assembled in zones but the zones terminate the central axis or branch. Under such circumstances the shoot begins to take on many of the characteristics of the flower and if we allow the definition of a flower as a shoot beset with sporophylls, it really is a flower. In the plants in which the flower comes to its highest development this structure is essentially a group of two kinds of sporophylls set round with sterile leaves called petals and sepals. Did ferns, instead of selaginellas, produce two kinds of sporophylls, the whole fern plant with its crown of fronds, would be very like a flower.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in, or omissions from, this list.

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DARLING, N. *Observations on some Lycopodiums of Hartland Vt.* illust. American Fern Journal, Ap. 1912.

DODGE, C. K. *The Fern-flora of Michigan*. Fern Bulletin, Ja. 1912.—Fifty-eight ferns and thirty-one fern allies listed with notes.

COCKAYNE, L. *Some Noteworthy New Zealand Ferns*. illust. Plant World, Mr. 1912.

HILL, E. J. *Additions to the Fern-flora of Indiana*. Fern Bulletin, Jl. 1912.—New stations for several species.

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PRESCOTT, A. *The Osmundas*. Fern Bulletin, Ja. 1912.

SAFFORD, W. E. *Notes of a Naturalist Afloat*.—III. illust. American Fern Journal, Ap. 1912.—Occasional mention of common Ferns.

SCHAFFNER, J. H. *The North American Lycopods without Terminal Cones*. illust. Ohio Naturalist, Ap. 1912.—*Lycopodium porophyllum* regarded as of specific rank.

WINSLOW, E. J. *Some Hybrid Ferns in Connecticut*. American Fern Journal, Ap. 1912.

EDITORIAL.

The last number of this magazine—that for October 1912—will be a comprehensive index of the publication for the past ten years. This, with the index to the first ten volumes, will form an exceedingly valuable index to the fern literature of America, covering, as it does, the whole period of popular fern study. It begins some years before the appearance of any popular fern book and has either published entire all important articles issued since or given a summary of them. Mr. S. Fred Prince, long a member of the Fern Society is already at work on the index and we hope to issue it not later than the end of the year.

* * *

Further information received from the purchaser of the complete set of this magazine recently sent to Germany, apprises us of the fact that the set is not to remain in Europe. It was purchased for a customer in South America (Argentine), therefore the set owned by M. C. Belhatte at Paris is the only one in Europe. The recent set is also the only complete set in South America, and there are not, so far as we are aware, complete sets in other parts of the Old World though the set at the Tokyo Botanical Garden ought to be nearly complete and the set owned by D. Leroy Topping at Manila lacks only two numbers.

* * *

Next year it will be too late to get odd numbers to complete files that lack them. When this magazine goes out of business we shall retain only complete volumes. This is the time for all who need odd numbers to ask for them. We have recently advertised to send any back volume later than volume 9 for 50 cents and this offer will hold good until the end of the year. After that time, single volumes cannot be had

unless we happen to have a surplus. We are willing to replace soiled, torn or missing numbers free if requested to do so at once, and the fact that odd volumes will soon be unobtainable should incline all whose sets are incomplete to add the missing volumes while they can.

BOOK NOTES.

In anticipation of the consolidation of this magazine with *The American Botanist* at the end of the year, some very extensive improvements in the new magazine are to be made. Among the more important are a better grade of paper, the use of numerous illustrations, and the addition of enough pages to make it the largest magazine for the price in America. With the beginning of 1913 a department of ornamental gardening will be included in which the cultivation of our showy wild-flowers will receive adequate treatment. This magazine will continue the matter relative to ferns now appearing in *The Fern Bulletin* and all manuscripts used will be paid for. No reader of *Fern Bulletin* should fail to subscribe for the new *American Botanist* if they wish to keep abreast of the times in botany. Those who subscribe for 1913 before November 20th, will receive the November issue free.

Messrs. Ginn & Co. have nearly ready for publication a book on Agronomy by the editor of *The Fern Bulletin* which should be of interest to all who have anything to do with cultivating plants. Although the book is intended as a school book to be used in connection with gardening courses, the fact that it not only gives directions for planting and cultivating kitchen vegetables and flowering plants, but explains

the principles upon which such directions hinge, will make it of much value to the gardener whether amateur or professional. The book, however, is not a mere gardening manual. It discusses soils and their origin, the fundamentals of landscape work and plant breeding, and the effects of heat, light and moisture upon plants in general. There will also be more than 200 illustrations.

FERNS WEIGHING A TON.—In the tropics ferns often attain the height of small trees, but their trunks are usually so slender that they never are of any great weight. For the heaviest trunks we must look among lowlier species, where the circumference of the short trunk in some cases is so great that immense weights are attained. In Australia and New Zealand there grows a relative of the common cinnamon fern named *Todaëa barbata* which quite takes the palm in this respect. The trunks are great rounded mosses five or six feet high and at least twenty feet in circumference, most of the upper surface being beset with living fronds. Specimens have been found with trunks that were estimated to weigh more than a ton and a half.

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No. 3

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1912



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XIPHOPTERIS SERRULATA—Natural Size

THE FERN BULLETIN

Vol. XX

JULY, 1912

No. 3

POLYPODIUM OR XIPHIOPTERIS?

BY WILLARD N. CLUTE.

There are times when one has almost a shade of sympathy for those who tinker with generic names. When one gets the characters of a genus well in mind and then in further studies finds specimens referred to that genus which apparently have none of the earmarks of the group he is tempted to think that there might possibly be cases where a change of name would be beneficial. Nor is it the distant and obscure genera that fall into this category. As common and familiar a genus as *Polypodium* has a lot of poor relations or second cousins connected with it, and these are often grouped with more representative species though they may look so little like typical members that it is not easy to see the relationship. If there is one thing that the beginning fern student comes to feel sure of, it is his ability to identify the *Polypodiums* by means of their rounded fruit dots lacking an indusium. This holds good, it is true, for all ordinary occasions, but taking the group as a whole, there are many exceptions to it. Recently a polypody was shown in this magazine in which the sori were apparently linear like those of *Asplenium* and we have chosen for illustration this time another species quite unlike the conventional polypody.

Polypodium serrulatum, whose likeness is presented in the frontispiece is not only unlike a polypody but unlike most other ferns as well. Its small stature and slender leaves suggest a fleeting resemblance to the lit-

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tle curly grass (*Schizaea pusilla*) but it is likely to be overlooked by the ordinary observer who would never expect to find a fern in such a disguise. Small as it is, it has not been unsuccessful in the struggle for existence and is found nearly around the world in the tropics—in the West Indies, Peru, Brazil, Madegascar, the Hawaiian Islands and the Guinea Coast, to mention only a few of its haunts.

The fern's grass-like appearance is strengthened by the fact that it often grows in dense colonies. Along some of the mountain paths in Jamaica it is spread so thickly that the hurried collector finds it most convenient to tear up a sod of it and sort the individual plants at his leisure. When growing the plant is from three to five inches tall but it is not safe to jump to the conclusion that the fronds are of that length. As a matter of fact, they are much shorter and the apparent length is due to the fact that the rootstock is nearly erect. The fronds given off at intervals along the rootstock is another touch that adds to its grass-like appearance. The fertile fronds usually appear toward the tip of the rootstock and so are borne higher than those devoted to purely vegetative functions. Like the latter, the fruiting leaves consist of a midrib beset with the finest of tooth-like pinnules which have evidently given the specific name to the plant, but at the tips they are somewhat broader and have nearly entire recurved margins which half enclose the sporangia. The latter are borne in what seems to be a single linear sorus close to the midrib but which the scientist considers several oblong sori that ultimately become confluent.

Owing to its various peculiarities this plant is often ruled out of the genus *Polypodium* and is then placed

in the genus *Xiphiopteris*. Although seldom accused of promoting changes in fern names, we confess to a liking for *Xiphiopteris*. The plant from which our drawing was made was collected along the footpath from Cinchona to Morces Gap in the Blue Mountains of Jamaica.

OPHIOGLOSSUM VULGATUM IN NEBRASKA

BY JAMES M. BATES.

While collecting plant rusts on Snake Creek, Cherry County, Nebraska, August 21, 1912, my eye caught this strange plant, which I had never seen before. It grew six inches to nearly a foot high. At sight of it I said to myself "That can be nothing but Adder's tongue; what else could Adder's tongue look like?"

It is new to Nebraska, and I think has not been found in Iowa. It agrees perfectly with the descriptions in the manuals. The *Fern Bulletin*, Vol. XX, No. 2 gives but "a single plant" in Herbaria for Illinois. It would be very interesting to learn, now, what localities across the continent warrant the statement of range in our manuals. Britton says "Pr. Edward Island to Alaska, south to Florida." Gray 7th edition gives no range. Small repeats Britton word for word. Nelson's Rocky Mountain Flora knows it not. It is evidently a good "find." There is twenty rods of it at least in a peaty meadow in company with *Eleocharis acuminata*, *carex interior*, *Aster junceus*, *Eupatorium perfoliatum*, *Spartina Michauxiana*, *Agropyron pseudorepens*, and such ilk. This swamp is just north of Prideaux Sanford's sod house on Snake Creek, Kennedy, Nebraska, 40 miles southwest of Valentine, the county seat. I give these data so that the knowledge of this location may not die with me.

Red Cloud, Neb.

PRIORITY AND FERN NAMES.

BY WILLARD N. CLUTE.

The subject of botanical nomenclature is one that bids fair to engross the attention of students for a long time to come. The great obstacle to a definite and settled list of plants names, is the fact that no two groups of botanists can agree upon the cognomen a given plant should bear. Here in America we have two distinct codes each with a considerable following. The "Vienna Code" is of world-wide adoption and one would naturally expect it to be supported by all botanists worthy of the name, but so difficult to suit are scientists of this bent that many have adopted a set of rules which they call the "American Code" and will be guided by no other. It may be said that any code would be good enough if, when once made and accepted, no further changes were made in it, but this never seems possible. The makers of a code seem always desirous of adding a few more touches to their handiwork. Like our political law-makers they are prone to leave some "joker" in their rules which makes it possible to undo the work and do it all over again.

Among botanists the greatest joker is "priority" but priority has been found to be no joke. In theory it is desirable to begin with the first name given a species and to call the plant by that and nothing else, but unfortunately there is no way of determining that any given name is first. Many a plant student who is willing to call a plant anything so long as the name is settled, is calling the nametinkers everything because they will not allow what is settled to remain settled. The Vienna rules adopted the date 1753 as the starting point, and a certain book of Linnaeus' as the one be-

yond which no botanist should go in digging up forgotten names, but alas for human instability, the congress which met at Brussels five years after these rules were made, added a few amendments of its own. It declined to call 1753 the starting point for the nomenclature of all groups and now proposes no less than twenty starting points. It is small wonder that the plant student fails to go far on the road to stability when we consider his numerous starting places. Another thing the Vienna congress did was to establish a list of *nomina conservanda*, that is, a list of plants that are exempt from changes of name without regard to priority. The Brussels congress increased this list, to the great delight of plant students and the corresponding disgust of those whose chief aim in life seems to be the rearranging of plants under different names. The average plant student usually cares little what name a plant bears so long as it is permanent, the name tinker, on the other hand, loses all interest in any species that can not be jarred loose from its scientific cognomen at least once a year.

Why should anybody care anything about priority? Well, it gives them an object in living if it serves no other use. A good many species makers claim they are interested in seeing justice done to the botanizers, plant collectors and herb doctors of an ancient day, but there is a large-sized suspicion abroad that they are more interested in seeing that credit is given to name-tinkers of the present. Those beautiful rules of both the Vienna and "American" codes offer great inducements to the plant-jugglers to continue their abominable practices. In effect they rule that anyone who shall take a plant from one genus, put it in another

and get away with it, shall be "honored" by having his name added to the specific name in the "author citation." This absurd proposition has produced a large number of nomenclaturists deeply skilled in the practice of distinguishing differences between tweedledee and tweedledum—or of making such differences if none exist.

But if real priority is the object of the game, why stop at 1753? Many plants were named much earlier. The willow, the oak, and the bracken for instance, were known to Dioscorides nearly two thousand years ago. Why give Linnaeus the credit for these names, simply because they appear in the book which is named as one of the starting points. Those botanists who insist that if priority is to be the game we should play it right and go clear back to Adam if possible, seem to be on the right side of the argument. To delve in the dusty archives of the past with the hope of unearthing a name with which to upset the work of others may seem to some hardly worth the effort, but while the priority fad holds sway, we should not enter into the search half heartedly. Let us give the old names such a shaking up that when they settle they will remain in this condition. Most species makers object to this. According to the *Midland Naturalist* "The strongest objection to historical priority in plant names comes from the type of superficially educated botanists of our day, unacquainted with the greek and latin classics and unable in many cases to make up for their newly discovered genera or species, names that are either grammatical or correct." This writer insists on "Indisputably proved absolute historical priority," but he will not get it if the aforesaid "superficially educated

botanists" have their say about it. All in favor of the motion please say "aye." We hear nothing but "nays"—or perhaps one or two neighs and brays may be detected. The motion is lost.

Once we were inclined to follow those Vienna adherents who shouted "priority" but we soon discovered that we ran a big chance of buying a gold brick. If we favor any further priority it will have to be so securely nailed down that it cannot be pried loose. If priority is a good thing let us have it undiluted, let us go back to Adam at once. That is one way to beat those priority people who are approaching the same end by degrees.

The changes made in our fern names by adhering to absolute historical priority are not as many as might be supposed. The greatest changes are in the author citations rather than in the names themselves. As an evidence of the truth of this statement it may be interesting to run through the list of fern names as they would appear if real priority were followed.

The order in which the ferns occur would no longer be called Filices or Filicales. The names of the families would remain as at present but the order would become Dorsiferae of Rivinius.

Our common sensitive fern would be found in the genus *Angiopteris* of Mitchell and while the ostrich fern, often classed with it, would remain in the genus *Struthiopteris* of Cordus it would get a new specific name and be known as *S. cordi*; thus vanishes *Mat-teucia* and *Onoclea* as generic names and *Germanica* as a specific appellation.

The absurdity of maintaining the genus *Filix* for *Cystopteris* is shown when it is known that "filix"

is literally translated fern and was often used for ferns in general. We see a similar use of it in the words *filicales* and *filices*, and yet the name changers solemnly ask us to believe that *Filix* is the proper name for the bladder ferns. How do these nomenclature tinkers keep their countenances when two of them happen to meet? As to the revived use of *Filix* as a genus, it is reported that Adanson, who made this a genus, has very doubtfully connected the bladder ferns with it.

A side light on the battle that once raged about the name of the wood ferns, is given by absolute priority in which it is seen that *Aspidium* is a synonym for the garden plant now known as *Alyssum*, that *Dryopteris* is synonymous with a form of *Asplenium* and that *Thelypteris* recently applied to this group was originally applies to the brackens. This leaves only *Nephrodium* and *Lastrea* to choose from. By sticking to *Nephrodium* for fifteen years, despite the suggested changes, we now find ourselves in the fashion again.

By a series of changes several of our small spleenworts find themselves in the genus *Trichomanes* of Dioscorides. Even the silvery spleenwort is included. By a similar shift the common maidenhair is *Adiantum Americanum* Cornuti. *Adiantum* and *Pteris*, by the way, are both credited to Theocritus who flourished about the beginning of the Christian area. This is real priority. The failure of the ancients to invent an alphabet earlier is probably all that saves us from a still weightier dose of "priority." But stay, the Chinese had a system of writing much earlier than this and now that that government has gone republican we may hope in time to follow "priority" back a few aeons more. It would never do to stop at Dioscorides when by so do-

ing we misplaced an honor rightly belonging to the cream of Tartar nobility who may have written on plants some thousands of years before even Adam was born.

If ever that "rule of priority" comes in contact with a parcel of horse sense what a wreck there will be. But who cares? The ferns still survive—call them what you please. And there ought to be enough names at hand now to suit almost anybody.

FERN FLORA OF ILLINOIS.

In spite of the efforts of both editor and contributor, an absurd error crept into the "Fern Flora of Illinois" published in the April number of this magazine. The data for *Adiantum pedatum* and *Polypodium polypodioides* were confused to the extent that the latter species was reported as common throughout the state. *Polypodium polypodioides* is, however, a rare species and found only in the southern part of the state. Its proper range should be given as "On trees and rocks. Jackson county *French*; Wabash, *Schneck*; and southward." The error was not likely to mislead anyone familiar with the species, but in the interests of accuracy the correction is here made.

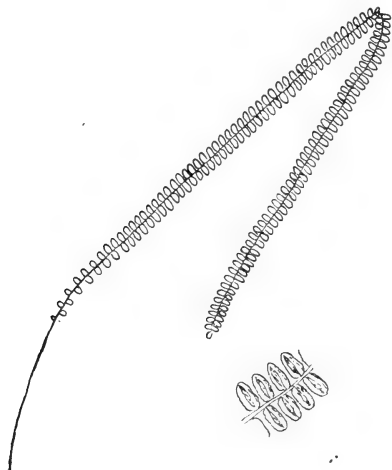
RARE FORMS OF FERNWORTS. —XXIII.

WHO CAN NAME THIS FERN?

The fern which is illustrated herewith, was collected by Mr. L. H. Hyde while on a trip to New Zealand in 1911. It was found on South Keppel Island where it grew in bunches like grass. Residents in the vicinity say that the fern grows nowhere else; but that is a common impression with regard to an unusual plant

or animal in any locality. In this case, however, it is quite likely to be true.

Unfortunately the specimens received are all sterile and unless one is familiar with the fern from other specimens he can only guess at its identity. From the



way in which the edges of the pinnules curve toward the midrib it appears like a species of *Pellaea* or *Cheilanthes*. The pinnules are exceedingly small as may be realized from the fact that the illustration is a little larger than natural size. If anybody can name the plant we shall be glad to hear from them.

PTERIDOGRAPHIA.

FERNS IN BOTTLES.—In volume XI of this magazine an account is given of the occurrence of numerous ferns in bottles which had been stuck upside down in the earth. Additional data on this point is given in a recent number of the *British Fern Gazette* where it is stated that in England it is quite a common thing for

ferns to spring up in bottles in this way, even in regions where no ferns have been growing. The bottles form so many little wardian cases in which the ferns find conditions very favorable for growth and seem to get along very well without a change of air. The writer of the article mentioned records a case in which a clear glass jar closed air tight for eight years had nevertheless supported a growth of ferns. In size the jar was but eight inches by three inches and neither water or air had been admitted since it was first sealed up. This phenomenon has been seized upon as a means of propagating ferns. It is reported that if small pieces of the rootstock are placed in such jars with an inch or so of clean moist sand in the bottom and then tightly sealed up, the pieces of rootstock will in time evolve new buds and roots and these will eventually become sturdy little plants. The point at which rootstock and stipe join, seems to be the region that most readily produces buds, but any living part of the rootstock may be depended on to do so in time.

NEW STATIONS FOR FLORIDA FERNS.—In the "Fern Flora of Florida" published in Volume XII of this magazine, the range of the golden polypody (*Polypodium aureum*) was given as northward nearly to St. Augustine. Its known range is now extended by Mrs. M. W. Satchwell who has found it in several places about Jacksonville a considerable distance farther north. In the same country (Duval) she also finds *Botrychium obliquum*, *Asplenium ebencum* and *Polystichium acrostichoides*, plants which heretofore were known only from the extreme north western part of the state. Duval county is on the east coast and some distance from the state line.

ADDITIONAL FERN PESTS.—It certainly does make a difference whose ox is gored! The fern student who finds a big fat grub eating the heart out of some choice specimen is likely to vote it an unmitigated nuisance, but the student of boring larvae would view the prize with delight. It seems that there is still a good deal to be found out about these larvae and the possibility of locating an occasional new species is good. The underground parts of many flowering plants are infested with such larvae and in most cases they seem to be pretty closely restricted to a single host plant, and do not occur outside the region inhabited by the plant. Among ferns which serve as hosts for borers are the sensitive fern and the brackens. Any fern with a rootstock of some size, however, may be suspected of harboring these insects, and only last summer Mr. Henry Bird of Rye, N. Y., found an unknown species in the rootstock of the common chain fern (*Woodwardia*). Mr. Bird is an authority on borers of all kinds and will be glad to name specimens sent in. When one finds a grub burrowing in the tissues of a plant, he should cut off sections containing the insect and, enclosing them in some small box, mail to Mr. Bird. The larvae do not seem very destructive to the ferns, but now is a good time to get the pests properly labelled.

NUMBER OF ARTICLES ON FERNS.—There is annually published in Germany a summary of all the publications on ferns in the world. The summary, however, lags somewhat and that for 1909 has just appeared. Glancing through preceding issues it is interesting to observe how the number of articles on ferns varies from year to year. From 1902 to the end of 1909 there were over 3600 articles published. For the

years these are as follows: 1902, 425; 1903, 434; 1904, 516; 1905, 460; 1906, 436; 1907, 447; 1908, 462; 1909, 465. The country most prolific in publications on ferns is Germany. Twice, however, in 1907 and 1908, America has lead in the production of fern literature but in 1909 the palm went back to Germany. As might be assumed, the bulk of the articles published deal with ecology, taxonomy and distribution. More than half of the total are on these subjects.

A NEW *EQUISETUM*.—In a recent number of the *Ohio Naturalist* John H. Schaffner describes a new species of *Equisetum* from Kansas. This is said to be an annual species, that is, the aerial stems do not survive the winter, but in other respects it is closely allied to *E. hyemale*. In this connection the late A. A. Eaton's statement that one might pick out a series of closely connected specimens from the largest to the smallest species is especially pertinent. There is no doubt that the group of plants which we have long called *Equisetum hyemale* consist, either of several species as the world now regards species, or else the species itself is extremely variable. The plants once referred to *Equisetum robustum* are now considered only a large form of *hyemale* and the plants which Eaton named *E. hyemale intermedium* are regarded by the describer of this new species as mere forms of *E. laevigatum*. It is seen, therefore, that botanists are by no means agreed as to what should constitute a species in this group. Schaffner makes two groups of these forms. One with persistent aerial stems which are more or less rough and fruiting cones tipped with a point. In this group are included as species *E. hyemale*, *E. robustum* and *E. laevigatum*. In the second

division is placed the new species which is named *E. Kansanum*. It is described as having annual smooth aerial stems and cones lacking a point. It may be mentioned here, that many of the characters relied upon for distinguishing species of *Equisetum* are worthless. The presence or absence of black bands on the sheath is largely a matter of soil, exposure and age. The form of branching is another feature without significance taxonomically though it does have a physiological relationship. None of the first year stems of the evergreen *Equisetums* branch if uninjured. If they live through the winter a renewal of growth may induce branching, especially if the tip has been broken off or killed back. The most reliable characters must always be taken from the nature of the stem—the number of grooves on the exterior, the size and position of the canals in its substance, the length of the joints and the size of the central hollow. It is very likely that exhaustive study will show that the genus *Equisetum*, at least in the exergreen and normally unbranched section, does not present a series of forms as clear cut as we find them in other parts of the vegetable kingdom.

TWO NEW FERN SPORTS.—In nearly every greenhouse where ferns are grown for sale will be found specimens of the holly fern (*Cyrtomium falcatum*). Its thick and glossy fronds are prime favorites with all who maintain living collections of ferns. Recently a laciniate sport has arisen from this which is now offered to the trade as *Cyrtomium Rockfordianum* though it should, of course, be *Cyrtomium falcatum* f. *Rochfordianum* if it deserves a name at all. Still another sport has been produced from *Adiantum tenerum*. The fern usually called *Adiantum Farley-*

ense is regarded as a sterile crested form of *tenerum* but as it apparently is always sterile, it is difficult to make sure on this point. The new sport is more certainly referred to its species because it bears fertile spores. These spores are said to reproduce the variations of the parent. The sport resembles the form *Farleyense* in being crested but is said to be much hardier. Thus far it has escaped a scientific name and is being sent out as the "glory fern" or "glory of Moordrecht."

NEW SOUTHWESTERN FERNS.—In *Muhlenbergia* for September, Leslie N. Gooding describes no less than five species and varieties of ferns from Arizona and an additional species from over the border in Mexico for good measure. No illustrations are given and as no material is at hand it is difficult to judge of the distinctness of the forms mentioned. Dr. Aven Nelson is reported to have seen the specimens which indicates that they may be good species. The single form described is called a new variety, *grandidentatum*, of *Asplenium parvulum*. Of the new species, one, *Asplenium rupium*, is in a genus in which it is not easy to make mistakes, but the others—*Notholaena hypoleuca*, *N. Cochisensis*, *Cheilanthes Sonorensis* and *Pellaea truncata*—are in genera in which the species already described are none too clear. It is to be hoped that illustrations of these ferns may be given in some botanical journal. This is especially desirable since no types are designated in the article describing the ferns though by implication they may be assumed to be in the University of Wyoming herbarium.

DEATH OF JAMES GOLDIE.—With much regret we record the death of James Goldie which occurred at his home in Guelph, Canada, November 3rd, 1912, in the 88th year of his age. The passing of James Goldie severs another interesting link connecting us with the past, for he was the son of that John Goldie after whom *Nephrodium Goldicanum* was named. The elder Goldie was born in Scotland 120 years ago and came to America in 1817 on a botanical collecting trip at the suggestion of Sir William Hooker. He spent several years in this work in Canada and the Middle States and dispatched three different collections to Europe but had the misfortune to lose all of them by shipwreck. Making a fourth collection he took ship himself and at last got safely home. In this last collection was the wood fern which has since borne his name and which was named in his honor by his patron, Hooker. In 1824 Goldie was engaged by the Russian government to aid in forming the botanical garden at St. Petersburg and in 1844 with his family he returned to America, settling at Ayr Ontario. Here he resided until his death in 1896 at the age of 94 years. James Goldie had much of his father's interest in plants though he did not make a profession of botany. He has been a subscriber to the *Fern Bulletin* almost since its beginning.

CRESTED CHRISTMAS FERN.—The Christmas fern (*Polystichum acrostichoides*) is so common as to be known to almost anybody, and yet it is a question whether it has ever been found with crested fronds until discovered recently by Mr. Amedee Hans near Locust Valley, Long Island, N. Y. Mr. Hans writes that he has been trying for a long time to develop a crested

form of this species or at least a crested form resembling it, by crossing it with crested forms of *Polystichum angulare* but without success. Now he has found a wild plant with the desired characteristic and expects soon to have plenty of the new form since sporelings are likely to repeat the aberrations of their parents and the plants found were in full fruit. With the exception of the tips, the fronds are quite like those of normal specimens. At the tip, however, the midrib divides again and again forming a compact little tuft. In writing of it Mr. Hans calls it *cristatum* and as the plant is better handled in literature if given a name it would be well to christen it *Polystichum acrostichoides* f. *cristatum*.

FERN FLORA OF INDIANA.—Since the publication of "The Fern Flora of Indiana" in the October 1911 number of this magazine, E. J. Grimes has reported one species new to the state list and recorded several additional stations for species previously known to grow in the state. *Ophioglossum vulgatum* previously known only from the southern part of the state and from one station in the extreme northwest, is recorded from Putnam county, near the center. In the same county *Woodsia obtusa* is said to grow sparingly on sandstone ledges. *Asplenium trichomanes* is also reported from this county as well as from Parke and Montgomery counties all these being new stations. *Nephrodium noveboracense*, apparently nowhere abundant in the state is reported from Parke county. The species new to the state is *Marsilia quadrifolia*. This was found "South of the Vandalia station at Greencastle in an old pond." The species is reported as being abundant on one side of the pond, though

rapidly disappearing before the encroachments of other vegetation. The species which has undoubtedly been introduced is said to have been noticed first by Dr. Barker of De Pauw University in 1904.

FERNS AS WEEDS.—Although ferns grow in great abundance in suitable spots throughout the world it is seldom that they become weeds. In newly cleared land in temperate regions the bracken may persist for a few seasons, and compete with the cultivated plants and nearer the equator other species may plague the cultivator in the same way, but in such cases the plants lack one of the essential qualities of weeds, namely, the ability to multiply and spread into new regions. As a general proposition ferns are not increasing in numbers anywhere. The nearest approach to this condition is seen in some of the fern allies. The field horsetail (*Equisetum arvense*) is undoubtedly a weed and quite able to spread into new territory, but with the exception of its harmful presence in low meadows, it may be questioned whether it is not more helpful than the reverse in which case it cannot be called a weed. Certainly a good many railway embankments are kept from washing by the matted stems and rootstocks of this species. And even in such places it seldom spreads at the expense of other plants. It is only when there is room that it takes an area to itself. The same is true of the water clover (*Marsilea*) and the azolla. They may fill up ponds where they gain a foothold but not to the exclusion of other species. In the tropics, also, a few ferns may behave in the same way. *Pteris longifolia*, and *Adiantum capillus-veneris* are fond of growing on old walls of every description and several others may take up positions on the roofs of houses, but

though a weed has been defined as "a plant out of place" and these are certainly out of place, they can only be called weeds by stretching the intent of the definition. As for ferns invading new territory as other weeds do, it may be doubted if such a case exists in the temperate zone.

BERMUDA FERNS.—Although the climate of the Bermudas verges on the tropical, its soil does not support a very luxuriant fern flora. What species there are, however, are mostly common plants of the American tropics such as *Acrostichum aurcum*, *Polypodium plumula*, *Pteris longifolia*, *P. caudata*, *Asplenium dentatum*, *A. myriophyllum*, *Nephrodium patens*, *Nephrolepis exaltata*, and *Polystichum adiantiforme*. A few species have been derived from North America, among which may be mentioned, *Osmunda cinnamomea* and *O. regalis*, *Woodwardia Virginica*, and *Nephrodium thelypteris*. Four species are supposed to be endemic, namely, *Nephrodium Bermudianum*, *Asplenium Laffanianum*, *Adiantum bellum* and *Nephrodium spluncac*. Other species reported are *Asplenium muticum*, *Anopteris hexagona*, *Psilotum nudum* and a *Salvinia*. In addition to these, collectors find *Adiantum capillus-veneris*, *A. cuneatum* and various other species commonly cultivated but the latter are believed to be escapes and not native. It is probable that the entire fern flora of Bermuda does not contain twenty-five different species. Very little attention has been paid to Bermuda ferns in American publications. The only list with notes seems to be that of B. D. Gilbert, published in *Torrey Bulletin* fifteen or more years ago.

TREE FERNS.

Tree ferns are characteristically inhabitants of wet, forested, tropical and subtropical regions and reach their best development in mountainous districts which are not subject to drouth or pronounced seasonal change. In the Greater Antilles they are found mainly on the northern slopes and summits of the higher mountains, as for example, the Sierra Luquillo of Porto Rico and the Blue Mountains of Jamaica, where the cool moisture-laden trade-winds from the north-east bring an ample supply of moisture. The fern vegetation to the south of these mountains is more or less strongly xerophytic both islands mentioned even having a semi-arid region of cactus and scrub growth. Similar conditions were noted on the Sierra Maestra of Cuba. Here on the comparatively dry southern slopes of the peak Torquino, at 3,500 feet, I found plants of *Cyathea arborca*, a species which in Jamaica and elsewhere in the West Indies rarely ascends to more than 2,500 feet.

Similar conditions upon a grander scale are observed upon the continent, the tree ferns being practically confined to the humid Atlantic slopes and to the high mountains. Thus in the mountainous parts of eastern Guatamala (Alta Verapaz) where, according to the native saying "It rains 13 months out of every 12" tree ferns are exceedingly abundant, a few species occurring at or near sea level but the most of them at from 4,000 to 6,000 feet altitude. West of this region, in the dry interior basin, they are wanting; and only two species, *Cibotium Wendlandti* and *Hemitelia costaricensis* are reported from the higher region near the

Pacific, even the moist forest belts of the volcanoes Fuego and Agua having none so far as known.

In Mexico, also, as might be expected, tree ferns are wanting from the interior arid high plateau region whose flora has been so thoroughly investigated during the past 35 years. Upwards of 20 species of Cyatheaceae are known from Mexico, but almost the only recent material of these is that secured upon occasional excursions from the table land into the moist lower regions bordering the *tierra caliente* of Vera Cruz.

In the several regions mentioned a few tree ferns are found to be partial to the lowlands. Among the West Indian species of this class may be noted *Cyathea arborea*, which, however, as already explained, exceptionally occurs high up on the southern slopes of the Sierra Maestra finding there congenial surroundings which are wanting at a lower altitude in this region. Upon the continent, *Alsophila microdonta* is found near sea level from Mexico along the Atlantic to South America. *Alsophila myosuroides* shows a similar preference for low altitudes, its known range extending on the mainland from Vera Cruz to Honduras and including also, Cuba and the Isle of Pines. Another very remarkable species of *Alsophila* (*A. Blechnoides*) ranges along the Atlantic coast from Guatemala to Trinidad.

Certain tree ferns occur typically as undergrowth in the dense shade of lofty forest trees; for example *Cyathea gracilis*, a Jamician species which grows usually in peaty soil in wet, sheltered depressions. The trunks of this, though commonly short, sometimes reach 8 to 12 feet, whereupon, according to Jenman they

"frequently fall and lie procumbent though this does not much affect their growth." In the mountain ravines of Java and Malaya there occurs, also, according to Christ a definite thicket formation of tree ferns "over which the crowns of the forest trees form a second forest." A similar "under forest" formation in which screw pines (*Pandanus*) are associated with tree ferns is mentioned from Celebes. These dwarf tree fern associations at high altitudes are believed to fill the important role of conserving the moisture by preventing radiation and the consequent drying out of the forest floor.

Perhaps a majority of tree ferns, however, occur as an integral part of the predominant forest growth, their crowns often rising nearly or quite to the level of the tree tops or in not a few species exceeding it as, for instance *Cyathea pubescens* one of the tallest Jamaican species which attains a height of 40 feet or more upon the heavily forested higher ridges of the Blue Mountains and easily thrusts its crown above the surrounding deciduous forest. There are also certain species, like *Cyathea furfuracea*, *Alsophila parvula*, and *Cyathea insignis* which in Jamaica grows indifferently in open or shaded situations though their occurrence in the open may have followed naturally from the partial and piecemeal clearing of the land, the small cleared patches remaining under cultivation for only a year or two before rapidly growing up to bush.

At least one species, *Cyathea arborea* flourishes in open situations commonly in very large colonies. Jenman has described it in Jamaica as "gregarious, often covering acres on fully exposed slopes everywhere shunning shade." Perhaps on the latter account and

also because of its ubiquity it is found more commonly than any other about dwellings and plantations, its huge lace-like fronds lending an unusual decorative charm to scenes already novel and interesting to northern eyes. The formation of groves of this species in relatively dryish open situations is almost unique for the family although a few, (e. g. *Alsophila armata*) are more or less gregarious in partial shade and many others of our American species are found in colonies in the deep wet forests. In New Zealand the social tendency has even resulted in the formation of large groves under intensely humid conditions. One of these which Colenso came upon in the forest called "Seventy-mile bush" in North Island is described by him as follows:

"On a flat in the heart of the forest, in a deep hollow lying between steep hills, the bottom which for want of drainage was very wet and uneven and contained much vegetable mud and water even in the driest summer season I found a large and continuous grove or thicket of very tall tree ferns, chiefly *Dicksonia squarrosa* and *D. fibrosa* with a few *Cyathea dealbata* intermixed, with but few forest trees and shrubs growing scattered among them. I suppose they occupied three rods of ground and I estimated their number to be 800 or 1,000. They were all lofty, from 25 to 35 feet high and in many places growing so close together that it was impossible to force one's way through them."

The stem or trunk of the *Cyatheaceae* varies greatly in dimensions, shape, and direction, and in most characters of outward appearance and covering though for a given species these features are, with a few exceptions fairly constant in mature individuals. The tall-

est tree fern known is *Alsophila excelsa* a nearly extinct species occurring upon Norfolk Island to the east of Australia whose trunks John Smith has stated to measure from 60 to 80 feet in length. Scarcely inferior to this is *A. Macarthuri* found upon Lord Howe's Island which, according to Maiden attains a height of from 60 to 70 feet. Among American species, the nearest approach to these dimensions of length is found, perhaps, in *Alsophila armata* which Jenman records as sometimes reaching fifty feet in Jamaica, "the head gradually diminishing in size as the stem lengthens."

The smallest member of the family in the world is *Alsophila Kuhnii* recently described from the Cordillera of Colombia in which the short rootstock is erect and the leaves, including the leafstalks, are but 8 inches long and the blades less than $1\frac{1}{4}$ inches broad. The smallest of the North American species is the Jamaica *Cyathea Nockii* looking most like some coarse bipinnate wood fern, its relatively stoutish stem 4 to 8 inches long, prostrate upon the ground and rooting underneath, its fronds 1 to $3\frac{1}{2}$ feet long borne in a crown.

The leaves of the *Cyatheae* vary in length from one to fifteen feet. In position they have been mentioned as arching in a semi-erect crown, spreading or even drooping. In many species of *Cyathea* and *Alsophila* and less commonly of *Hemitelia*, the trunks are more or less completely covered with spines, a fact which no one who has reached out hastily and grasped one in a futile attempt to stay his descent down some steep, slippery, forest-clad slope is likely to deny. As a rule, however, the trunks are spiny simply from the partial per-

sistence of the broken stipe bases which indisputably are spiny. In certain species the spines are long straight, columnar and blunt; in others low and broadly conical with a hooked point; in still others slender and sharp but very short and closely set. In color, spines range from yellow to brown, purple, and black, usually taking the color of the stipe or presenting a darker and highly polished surface.—*From an article by W. R. Maxon in Smithsonian Report for 1911.*

OWNERS OF COMPLETE SETS.

As this magazine closes its existence, it will be of interest to again indicate the whereabouts of the few complete sets that are known to be in existence. So far as we can ascertain these number thirty-one, three of which are owned outside of the United States. There are several sets that are known to be nearly complete. Mr. D. Le Roy Topping, of Manila, P. I. and Mr. W. A. Poyser, of Hammond, Indiana have sets lacking only one or two numbers, and the set owned by the late B. D. Gilbert, now in the public library Utica, N. Y., lacked only four pages of completeness. Several of the larger public libraries have files that are nearly complete. The perfect sets are as follows:

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 ARGENTINE REPUBLIC, owner of copy unknown.

INDEX TO RECENT LITERATURE.

CLUTE, W. N. *A Problematical Fern*. illust. Fern Bulletin, Ap., 1912.—The position of *Gymnogramma lanceolata* discussed.

CLUTE, W. N. *Rare forms of Fernworts*.—XXII. *Still Another Christmas Fern*. illust. Fern Bulletin, Ap., 1912.—A form with truncate pinnae and projecting midveins described as *Polystichum acrostichoides* f. *Gravesii*.

- CORNE, F. E. *Another Station in Central Vermont for Dryopteris filixmas and for the New Hybrid Filixmas x Marginalis*. American Fern Journal, Jl., 1912.
- DODGE, R. *Further Notes on Variation in Botrychium ramosum*. Fern Bulletin, Ap., 1912.
- HILL, E. J. *The Fern Flora of Illinois*. Fern Bulletin, Ap., 1912.—A list of 39 ferns and 17 fern allies given, with notes.
- PRESCOTT, A. *The Tall Spleenworts*. Fern Bulletin, Ap., 1912.
- PRINCE, S. F. *Notes on Various Ferns*. Fern Bulletin, Ap., 1912.
- RUGG, H. G. *Vermont the Fernlovers Paradise*. American Fern Journal, Jl., 1912.
- SAUNDERS, C. F. *Schizaea pusilla at Home*. Fern Bulletin, Ap., 1912.—Reprinted from *Linnacan Fern Bulletin*, Vol. 4.
- PTERIDOGRAPHIA. Fern Bulletin, O., 1911. *Black Spleenwort in America, Crested Ferns, Crested Marginal Shield Fern. Ferns for the House, Living Ferns found Fossil, Range of Cystopteris*.
- PTERIDOGRAPHIA. Fern Bulletin, Ja., 1912. *Alaska Fern, Filmy Ferns in Dry Regions, New Panama Club Mosses. The Bracken as a Weed, Woodwardia on Cape Cod*.
- PTERIDOGRAPHIA. Fern Bulletin, Ap., 1912. *Affinities of Taenitis, Apospory in Pellaea, a New Fern Pest, Ferns Weighing a Ton, Sporophyll zones, Stipe or Stipes, Walking Fern and Lime, Lycopodium Lucidulum porophyllum*.

EDITORIAL.

With this number of *The Fern Bulletin*, its existence as a separate publication practically comes to an end. A comprehensive index to the past ten volumes is already in the printers hands and will constitute the fourth number of this volume and the last of its existence. This is probably the first case on record of a magazine ceasing publication for lack of material to fill it. Usually it is the lack of subscribers that causes the demise of special publications but fortunately this is not the case in the present instance.

There is an evolution in magazine-making as in everything else. Magazines devoted to special subjects spring up, have their day and when their cycle is completed must move onward or die to make way for something else. When *The Fern Bulletin* was established there was abundant reason for its existence for there was not a single book devoted to the popular side of fern study in America. Only a few advanced botanists knew much about this interesting race of plants, and the study was full of conjecture and assumption in place of reliable facts. Many of what we now consider fairly common species were unknown, the ranges of all ferns were hazily defined and the interesting features of their life histories were practically unknown. Today the situation is far different. Any beginning student can find in the nearest library half a dozen books that will quickly and surely guide him to the name of his specimens and tell him all the important facts of their existence. What has been said of the ferns applies with still greater force to those plants which for want of a better name are called the fern allies. For a long time after popular fern study

had been taken up, they remained unknown, confused in the collectors mind with mosses and other low forms. But even these have at last become familiar and if books on the subject have not multiplied with the rapidity of books devoted to ferns, still, largely through the efforts of this magazine, the fern allies are now easily named and their characteristics discovered. The need for a magazine, especially devoted to ferns has passed. The few new facts that develop from time to time can as well be published in journals devoted to general botany.

The reduction of fern study to a science has not been accomplished without much hard and critical work by numerous investigators among which may be named Eaton, Gilbert, Graves, Dodge, Maxon, Parsons, Waters, Parish, Jones, Slosson, Hill, and Ferriss, but we feel warranted in saying that none have done more for the advancement of the study than this magazine and it is a source of pleasure to reflect that when the history of the last quarter of a century is written the magazine's achievement must hold a prominent place. With the aid of many contributors we have made the obscure clear, the unknown known, the rough places smooth, the acquiring of knowledge easy, but it can never happen again. The work of *The Fern Bulletin* is done.

As the facts about ferns became established and were preserved in books the supply of useful articles on ferns began to diminish. The end was easily perceived by one of any penetration and several years ago we announced the beginning of the end. We could not refrain, however, from carrying on the work to the end of the twentieth year. There is some satisfac-

tion to be had from the contemplation of a work continued successfully for such a natural period of time as the fifth of a century. Only two other botanical magazines have accomplished it and neither of these were individual enterprises. Both had the backing of a club or association. The lack of suitable manuscripts relating to ferns, however, is patent to all. The current volume of a well-known eastern magazine devoted to botany failed to include a single note on ferns. Of the twelve articles in the latest number of the only Old World fern journal eleven are written by one individual, the editor, while an American publication which claims to be devoted to ferns published in its last issue only two fern articles and filled the rest of its space with notes of travel.

Quite aside from what this magazine has accomplished for the study of ferns it has made several unique records. It is the only botanical publication in this country that has existed under a single editor for a fifth of a century, and it is the only one at present that depends upon its resources and does not look to some group of benevolent individuals to make good a possible deficit; in fact it never has had a deficit, in this presenting a striking contrast to its competitors. Although we have often been obliged by circumstances to lag behind our dates of issue we have a record of never doubling up on a volume by issuing one number in place of two. Moreover, considering the number of pages published the price has always been lower than any other. From *The Fern Bulletin* has also sprung another important journal, *The Bryologist*. For two years this publication was issued as part of *The Fern Bulletin* and only became a separate publication with the beginning of its third volume. Later it be-

came the organ of the Sullivan Moss Chapter, a society which was organized at the suggestion of the editor of *The Fern Bulletin*. The first printed reference to such a society was in the editorial pages of this magazine, and while the editor took a less active part in the formation of this society than he did in forming the American Fern Society, it is nevertheless true that both these important societies owe their existence in the beginning to his efforts. In a less remote sense can this magazine be said to have suggested the establishment of *The British Fern Gazette* though for some years before that magazine appeared the need for such a publication was urged and it is more than a coincidence that the magazine is almost an exact duplicate of *The Fern Bulletin* in size and typography. Its editor, however, has marked out a very different field of operations and the publication bids fair to hold the same relation to fern study in Britain that *The Fern Bulletin* has held so long on this side of the water. In passing it would give us pleasure to emphatically disclaim any connection with the founding of another recent publication which aspires to take up the burden we are about to lay down, but though we did much to discourage its appearance, we have some suspicion that if it were not for us the publication would not be here. That it may fall heir to all the problems of *The Fern Bulletin* is our sincere wish.

The editing of this magazine for twenty years has not been an unmixed pleasure. There have been times when but for our interest in the ferns themselves we would have gladly shut up shop, but looking back through the years, we realize that the pleasure has overbalanced the disappointment. The work has brought us many strong friends and spiced the mixture

with a few misguided enemies. Our contributors and subscribers have not spared themselves in pushing the magazine forward and we again extend to them our thanks with a full realization of how poorly the words express the gratitude we feel. We lay down the pen with gladness, though we part company with its associations with a keen sense of regret. Another chapter is closed but over the leaf a new one begins. Though *The Fern Bulletin* be dead, its spirit will live in the pages of *The American Botanist* into which it now merges.

WILLARD N. CLUTE.

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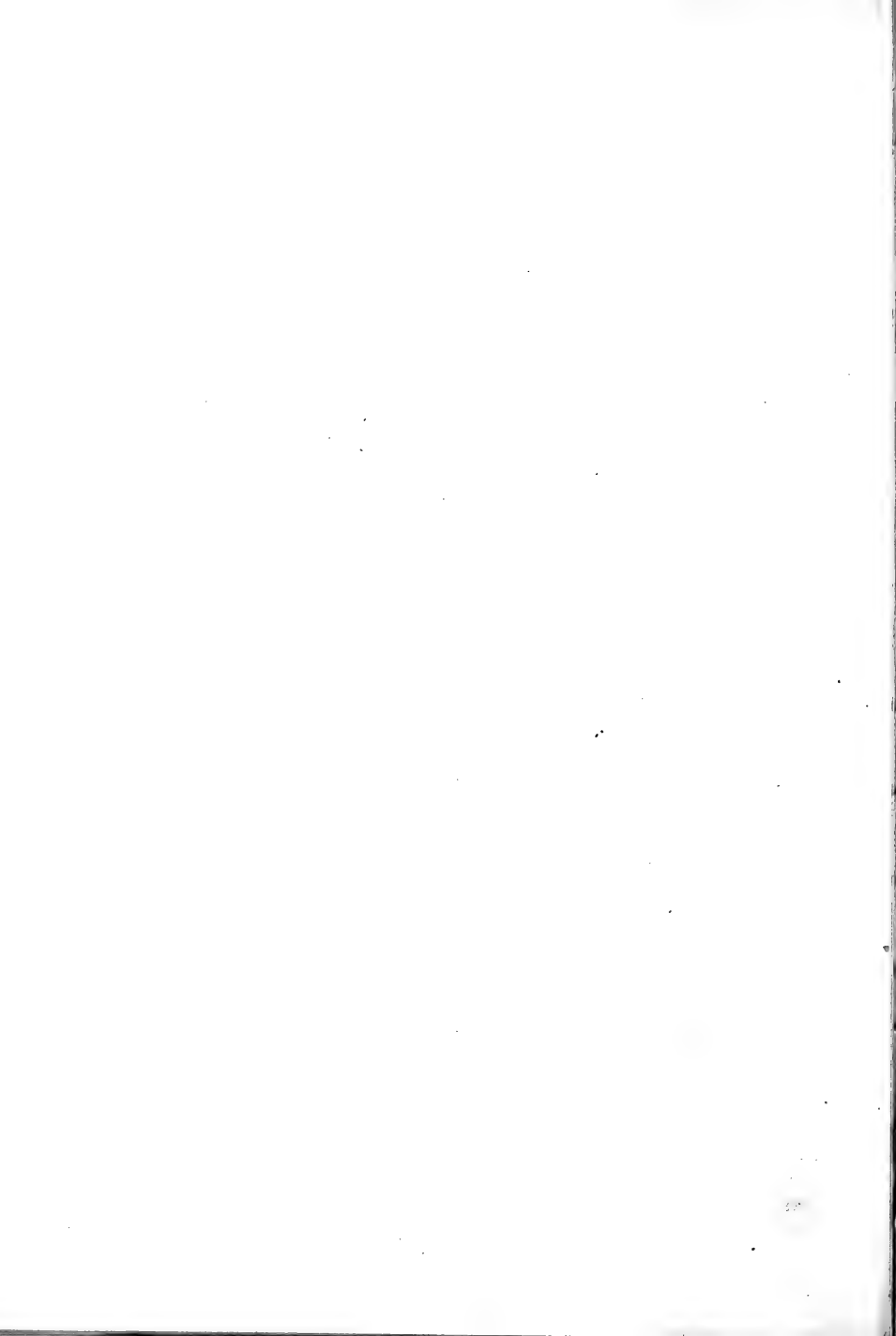
This Index to the last ten volumes of *The Fern Bulletin* is divided into three parts, viz:—A General Index, containing the titles of all articles closely cross referenced; a second part, Pteridographia, containing most of the short notes and unsigned articles; and an Index to Species containing the name of every fern, as it appears in the text, about which anything is said which might prove of value in its study.

Illustrated articles are marked with a star (*), articles containing descriptions of ferns are indicated by a dagger (†) and descriptions of new ferns are indicated by a double dagger (‡).

S. FRED PRINCE.

Champaign, Ill., December, 1912.

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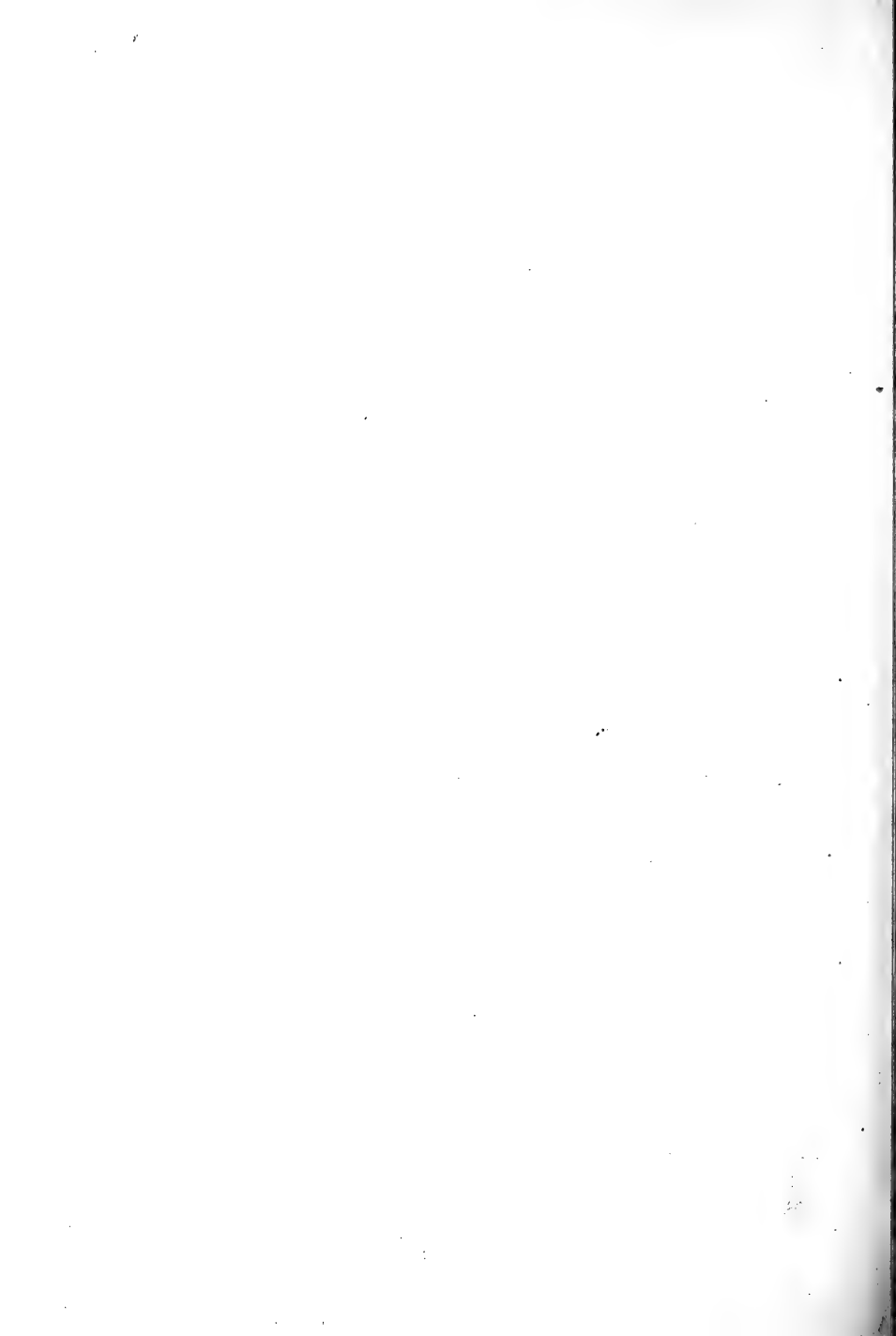
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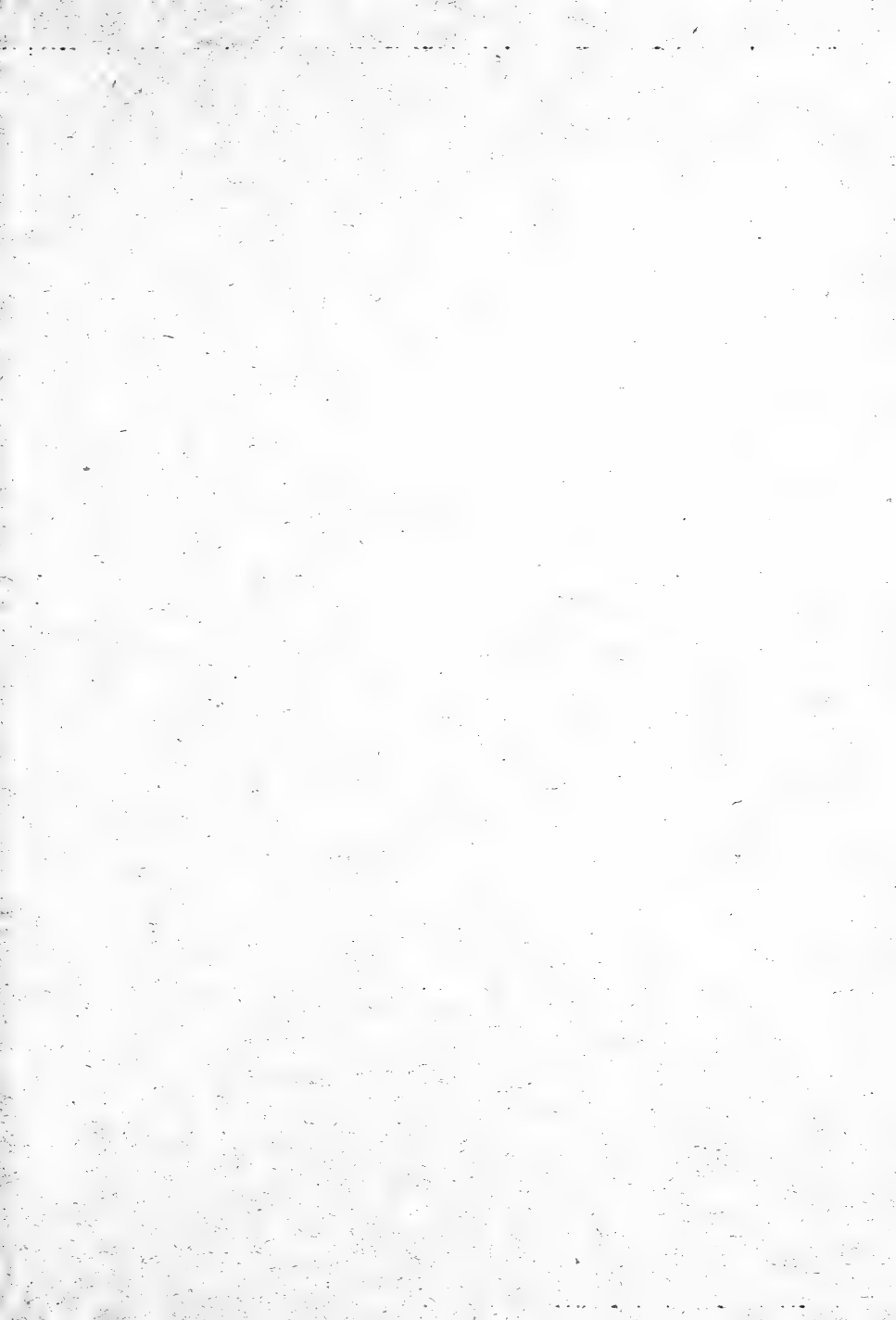
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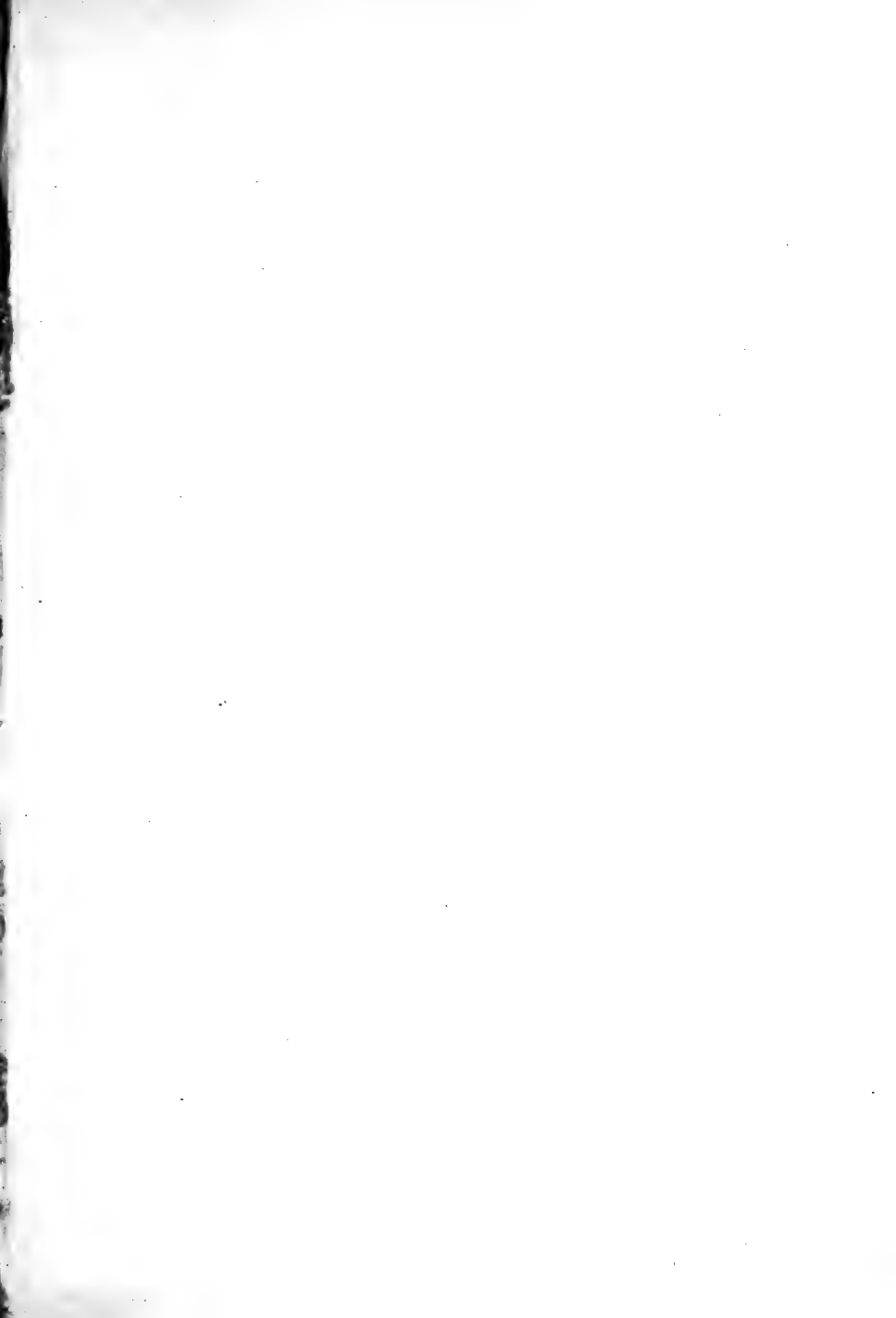
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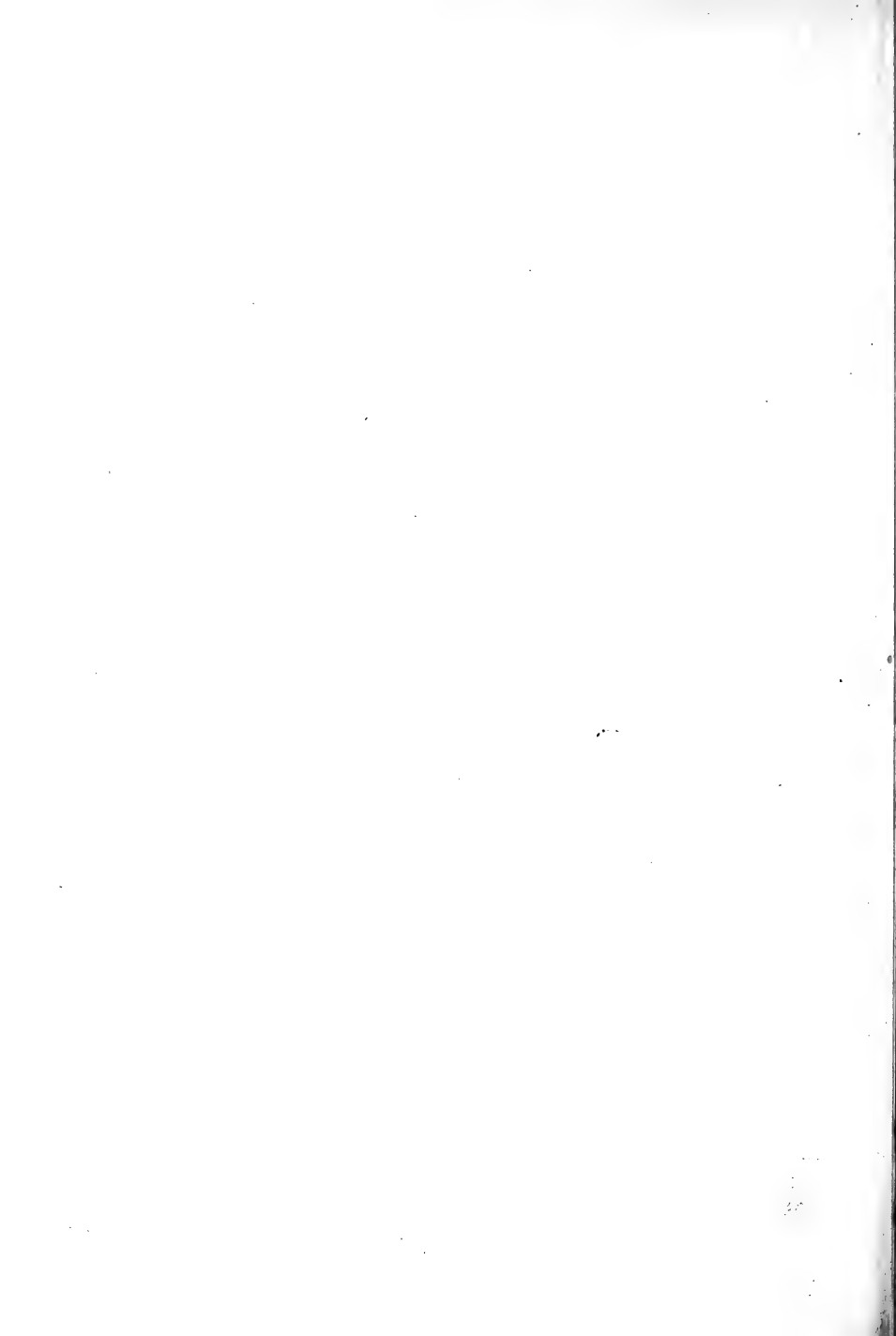
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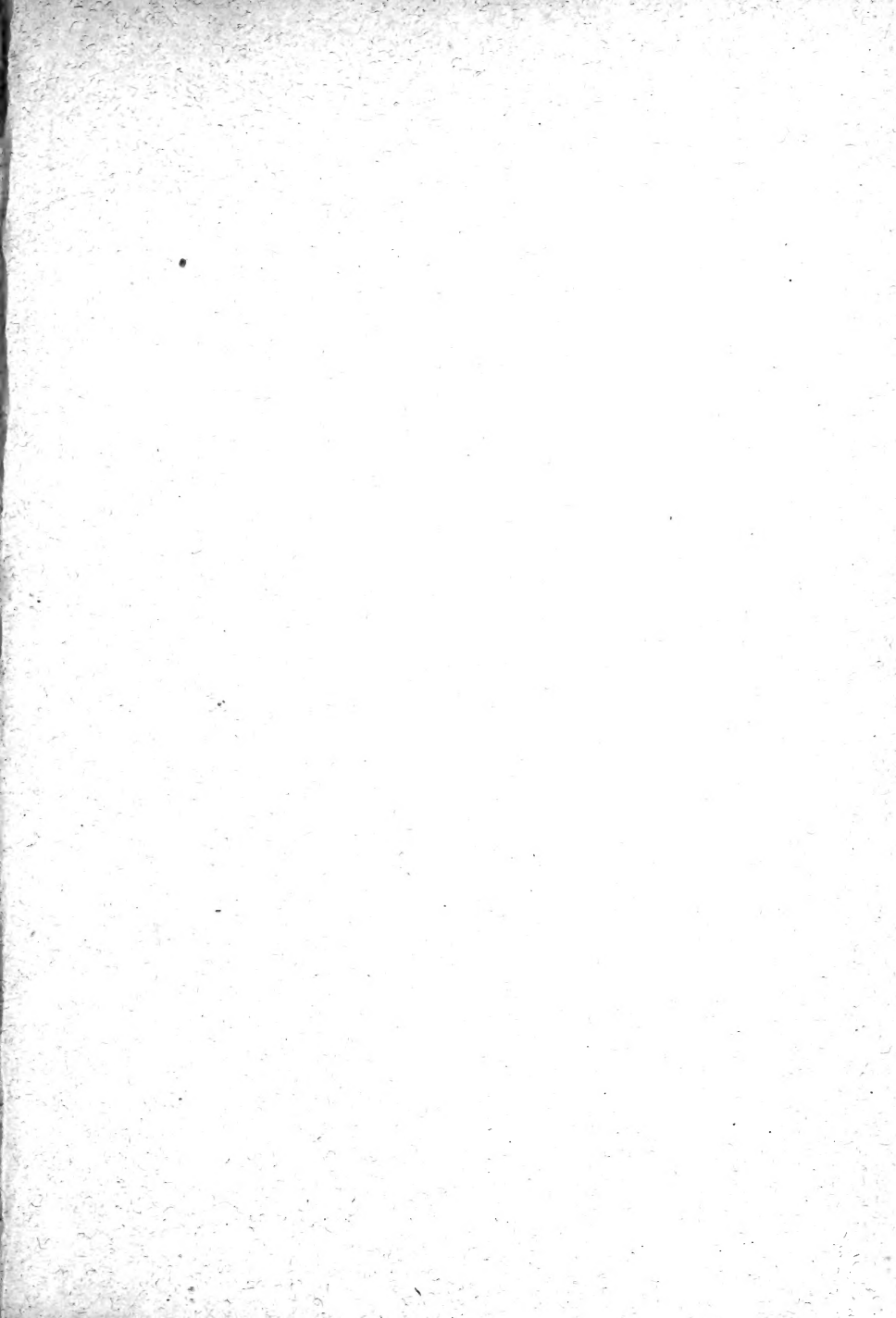
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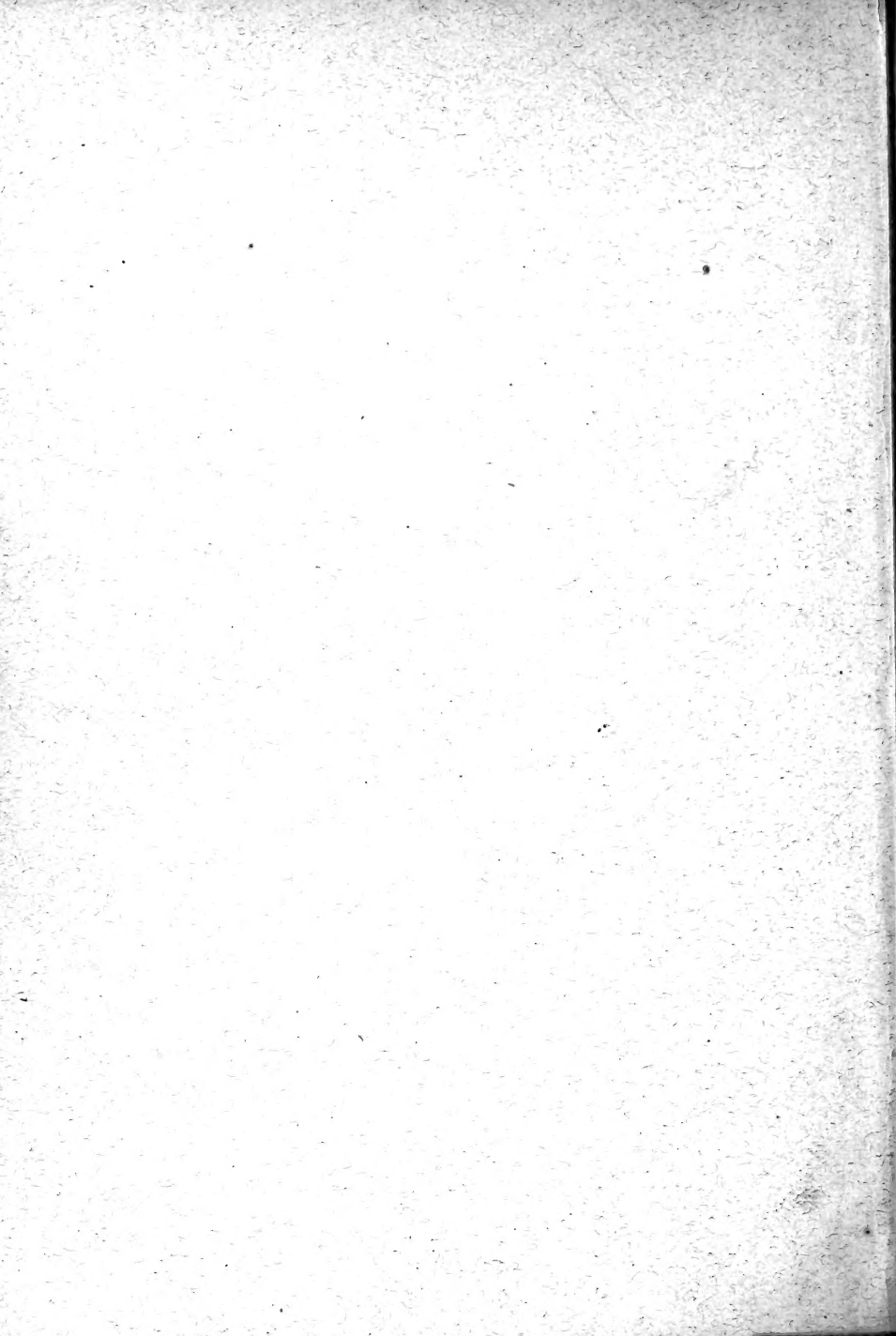
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